

BEFORE THE  
PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

APPLICATION OF KIAWAH ISLAND UTILITY, INCORPORATED TO FILE PROPOSED  
CHANGES IN RATES, CHARGES, CLASSIFICATIONS AND/OR REGULATIONS FOR  
WATER AND SEWER SERVICE

DOCKET NO. 2021-324-WS

DIRECT TESTIMONY  
OF  
AARON L. ROTHCHILD

COST OF CAPITAL

ON BEHALF OF  
SOUTH CAROLINA DEPARTMENT OF CONSUMER AFFAIRS

February 24, 2022

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**I. STATEMENT OF QUALIFICATIONS**

**Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.**

**A.** My name is Aaron L. Rothschild. My title is President, and my business address is 15 Lake Road, Ridgefield, CT.

**Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

**A.** I am President of Rothschild Financial Consulting (“RFC”).

**Q. PLEASE STATE YOUR EDUCATIONAL ACHIEVEMENTS AND PROFESSIONAL DESIGNATIONS.**

**A.** I have a B.A. degree in mathematics from Clark University (1994) and an M.B.A. from Vanderbilt University (1996).

**Q. PLEASE DESCRIBE YOUR BUSINESS EXPERIENCE.**

**A.** I performed financial analysis in the telecom industry in the United States and Asia Pacific from 1996 to 2001, investment banking consulting in New York, complex systems science research regarding the power sector at an independent research institute, and I have prepared rate of return testimonies since 2002. See Appendix A for my resume.

**Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA, OR OTHER STATE COMMISSIONS? IF SO, WHICH COMMISSIONS?**

**A.** Yes, I have previously testified before the Public Service Commission of South Carolina (“Commission”). My expert witness experience also includes testifying in over 50 cost of

capital proceedings before the following state commissions: California, Colorado, Connecticut, Delaware, Florida, New Jersey, Maryland, North Dakota, Pennsylvania, South Carolina, and Vermont. See Appendix B for the list of dockets for each of my testimonies.

**Q. ON WHOSE BEHALF ARE YOU PROVIDING THIS TESTIMONY?**

**A.** I am testifying on behalf of South Carolina Department of Consumer Affairs (“DCA”).

**Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?**

**A.** On November 30, 2021, Kiawah Island Utility (“KIU” or “the Company”) filed an application requesting revenues of \$10,973,313 based on a 14.25% operating margin.<sup>1</sup> The purpose of my testimony is to provide my recommendation to the Commission regarding (1) the appropriateness of setting KIU’s rates based on rate of return regulation instead of the operating margin method, and (2) provide my recommendations to the Commission regarding the appropriate authorized return on equity (“ROE”), cost of debt, and capital structure for KIU. My recommendation regarding the appropriateness of setting the Company’s rates based on rate of return regulation instead of the operating margin method, as requested by the Company, is based on the following statement made by the Commission:

There is no statutory authority prescribing the method which this Commission must utilize to determine the lawfulness of the rates of a public utility. For a water and sewer utility whose rate base has been substantially reduced by customer donations, tap fees, contributions in aid of construction, and book value in excess of investment, the Commission may

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<sup>1</sup> Mr. Sorensen’s Direct Testimony, page 2, lines 5-6.

1 decide to use the "operating ratio" and/or "operating margin" method for  
2 determining just and reasonable rates.<sup>2</sup>

3 Additionally, my recommendation is consistent with the following legal standards  
4 set by the United States Supreme Court for a fair rate of return:

5 The return to the equity owner should be commensurate with returns on  
6 investments in other enterprises having corresponding risks.<sup>3</sup>

7 And

8 ...sufficient to...support its credit and...raise the money necessary for the  
9 proper discharge of its public duties.<sup>4</sup>

10  
11 **Q. WHAT IS THE DIFFERENCE BETWEEN THE COST OF EQUITY AND THE**  
12 **AUTHORIZED RETURN ON EQUITY FOR A REGULATED UTILITY**  
13 **COMPANY?**

14 **A.** The cost of equity ("COE" and "cost of equity" are used interchangeably throughout the  
15 testimony) is the market-based return investors expect to earn on the market value of any  
16 given stock. As it applies to this consolidated proceeding, it is the return investors require  
17 to provide equity capital to KIU. The appropriate authorized ROE is based on the  
18 Commission's determination of the COE at the time of the proceeding based on the  
19 evidentiary record, which incorporates investor expectations. Once the Commission issues  
20 an authorized ROE, the market-based COE will continue to fluctuate as capital markets  
21 inevitably continue to change. The authorized ROE is based on a snapshot of the COE,  
22 which is constantly changing.

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<sup>2</sup> Commission Order 94-644, Docket 93-737-WS.

<sup>3</sup> *Federal Power Commission v. Hope Natural Gas Company* 320 U.S. 591, 603 (1944).

<sup>4</sup> *Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia* 262 U.S. 679, 692-693 (1923).

1 **Q. PLEASE DEFINE THE APPROPRIATE RATE OF RETURN.**

2 **A.** The appropriate Rate of Return (ROR) is based upon the weighted average cost of debt and  
3 equity (WACC) at the time of this proceeding. The weighted cost rate is calculated by  
4 multiplying the capital structure ratios of the sources of capital (debt, preferred equity, and  
5 equity) times respective cost rates. The ROE and ROR can be adjusted up or down in the  
6 next cost of capital proceeding based on the market-based cost of capital (equity and debt)  
7 at that time.

8 
$$\text{WACC} = \text{Cost of Debt} \times \text{Debt Ratio} + \text{COE} \times \text{Common Equity Ratio}.$$

9 **Q. HAVE YOU REVIEWED KIU'S APPLICATION AND DIRECT TESTIMONY?**

10 **A.** Yes.

11 **II. INTRODUCTION AND SUMMARY OF RECOMMENDATIONS**

12 **Q. HOW IS YOUR TESTIMONY ORGANIZED?**

13 **A.** First, I provide a summary of my recommendations, an overview of cost of equity concepts,  
14 and how current capital markets relate to my cost of equity calculations. Second, I provide  
15 a more detailed discussion of current capital markets. Third, I provide a detailed  
16 explanation of the various models I use in my cost of equity calculations.

17 **Q. PLEASE PROVIDE A SUMMARY OF YOUR RECOMMENDATIONS.**

18 **A.** First, I recommend that KIU's rates be set based on rate of return regulation instead of the  
19 operating margin method requested by the Company. Second, I recommend that the cost  
20 of equity allowed for KIU should be between 6.78% and 8.16% (recommended at the  
21 midpoint of 7.47%). Based on my recommended common equity ratio of 49.86% and my

recommended cost of debt of 3.39%, that results in an overall cost of capital of between 5.08% and 5.77% (recommended at 5.42%). Table 1 below shows the midpoint of my ROE recommendation along with the resulting overall recommended ROR for KIU:

<b>TABLE 1: ALR RECOMMENDED RANGE MIDPOINT - KIAWAH ISLAND UTILITY</b>			
<b>Docket No. 2021-324-WS</b>			
	<b>Capital Structure Ratios</b>	<b>Cost Rate</b>	<b>Weighted Cost Rate</b>
<b>Long-Term Debt</b>	50.14%	3.39%	1.70%
<b>Short-Term Debt</b>	0.00%	0.00%	0.00%
<b>Preferred Equity</b>	0.00%	0.00%	0.00%
<b>Common Equity</b>	49.86%	7.47%	3.72%
<b>Rate of Return</b>			5.42%

Exhibit ALR-1

**Q. PLEASE COMPARE YOUR COST OF CAPITAL RECOMMENDATIONS TO KIU'S REQUESTED 14.25% OPERATING MARGIN.**

**A.** KIU does not provide rate of return testimony or a specific ROE request. However, according to KIU their requested 14.25% operating margin equates to an implied ROE request of 11.24%<sup>5</sup> and an overall rate of return of 8.12%,<sup>6</sup> as shown in Table 2 below.

<b>TABLE 2: RECOMMENDATION COMPARISON - ROTHSCHILD AND SORENSEN</b>					
	<b>Cost of Equity</b>	<b>Cost of Debt</b>	<b>Common Equity %</b>	<b>Debt %</b>	<b>Rate of Return</b>
Rothschild [1]	7.47%	3.39%	49.86%	50.14%	5.42%
Implied Request [2]	11.24%	4.57%	53.20%	46.80%	8.12%

[1] Exhibit ALR-1

[2] KIU's responses to ORS AIR 9-2, ORS AIR 6-17b, and ORS AIR 4-19 Att a.

If my 7.47% COE is used to set rates for KIU, the rate of return portion of the revenue requirement will be about \$1.75 million annually. On the other hand, if KIU's

<sup>5</sup> KIU response to ORS 9-2. Exhibit ALR-6.

<sup>6</sup> KIU response to ORS AIR 4-19 Att a. Exhibit ALR-6.

requested 14.25% operating margin is used to set rates, the implied rate of return portion of the annual revenue requirement will be about \$2.66 million. As shown on Table 3 below, if KIU's request is adopted instead of my rate of return recommendation, consumers will pay approximately \$0.91 million per year more than would be necessary.

<b>TABLE 3: ANNUAL REVENUE IMPACT VS. REQUESTED - KIAWAH ISLAND UTILITY</b> (\$ million)		
	Rate of Return Portion of Revenue Requirement	Difference KIU Rothschild
<b>Rothschild</b>	\$1.75	
<b>KIU Request</b>	\$2.66	\$0.91

Inputs:

Requested Rate Base [1]	\$26.32
Federal income tax rate	21.00%
State income tax rate	5.00%
[1] KIU's Application, Schedule A	

**Q. WHAT IS THE DIFFERENCE BETWEEN THE OPERATING MARGIN METHOD AND THE RATE BASE METHOD?**

**A.** The operating margin is the percentage obtained by dividing the net operating income for return by the total operating revenues of the utility. In the rate base method, the utility's revenue requirement is determined by multiplying an authorized rate of return (weighted average of return on equity and cost of debt) by a rate base and adding operating and maintenance expenses. Rate of return regulation is a substitute for a competitive market and protects consumers by ensuring regulated utilities earn enough to attract the capital needed to provide safe and reliable service without overcharging consumers. The operating margin method makes it more challenging for the Commission to determine if a utility's rates are fair and reasonable.



1 **Q. IS RATE OF RETURN REGULATION SUPERIOR TO USING THE OPERATING**  
2 **MARGIN METHOD FOR UTILITIES WITH SIGNIFICANT RATE BASE?**

3 **A.** Yes. As discussed by the Commission and the South Carolina Supreme Court<sup>7</sup>, the purpose  
4 of the operating margin method is to set rates when a utility does not have significant rate  
5 base. This makes sense because if a utility does not have any significant rate base, would  
6 not be able to earn any money regardless of how large of an authorized rate of return they  
7 receive. Even a 100% authorized rate of return X \$0 rate base = \$0. However, when a  
8 utility has significant rate base, using the rate of return method is superior because, as  
9 explained below, it allows the Commission to set rates that are consistent with investors'  
10 required returns as indicated by the market-based cost of equity. The operating margin  
11 method makes it more challenging to determine if the utility is earning a high enough return  
12 to raise money without overcharging consumers.

13 **Q. DOES KIU PROVIDE SUBSTANTIAL EVIDENCE THAT SETTING ITS RATES**  
14 **BASED ON THE OPERATING MARGIN METHOD IS IN THE BEST INTEREST**  
15 **OF ITS CONSUMERS?**

16 **A.** No. The Company's only justification for applying the operating margin method in this  
17 proceeding is that the Commission has historically approved its rates based on the operating  
18 margin method.<sup>8</sup>

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<sup>7</sup> *Heater of Seabrook v. PSC*, 324 S.C. 56, 64 (1996)

<sup>8</sup> KIU response to ORS 2-30. Exhibit ALR-6.

1 **Q. IS YOUR RECOMMENDATION TO USE THE RATE BASE METHOD IN THIS**  
2 **PROCEEDING CONSISTENT WITH THE SUPREME COURT OF SOUTH**  
3 **CAROLINA’S CONCLUSTIONS ON THIS TOPIC?**

4 **A.** Yes. The Court stated that just because the “Public Service Commission has wide latitude  
5 to determine an appropriate rate-setting methodology...does not mean...that a particular  
6 methodology may not be more appropriate than another under a specific set of  
7 circumstances.”<sup>9</sup> As explained above, the Court explained that the operating margin  
8 method is appropriate when a utility’s rate base has been substantially reduced. KIU’s  
9 Original Cost Rate Base is \$26.3 million.<sup>10</sup> Therefore, setting KIU’s rates based on rate of  
10 return regulation is superior to the operating margin method because it will allow the  
11 Commission to determine if KIU has the lowest reasonable weighted average cost of capital  
12 as required by the landmark *Bluefield* and *Hope* cases.

13 **Q. ARE YOU RECOMMENDING A SPECIFIC ROE OR AN ROE RANGE FOR KIU?**

14 **A.** I recommend both a range of appropriate ROEs and a specific point within that range that  
15 I feel would be the most appropriate for KIU. As I explained in the hearings in the recent  
16 Blue Granite Water Company case,<sup>11</sup> applying the various COE models results in a range  
17 for the market-based COE and not a precise number. The range that I recommend for KIU  
18 already eliminates the extreme ends of the results of my models and reflects the range of  
19 ROEs I feel confident will allow it to raise the capital it needs to provide safe and reliable  
20 service. However, I also recommend a specific ROE within that range for KIU because

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<sup>9</sup> *Heater of Seabrook v. PSC*, 324 S.C. 56, 64 (1996).

<sup>10</sup> KIU response to ORS 2-29. Exhibit ALR-6.

<sup>11</sup> Application of Blue Granite Water Company for Approval to Adjust Rate Schedules and Increase Rates, Before the Public Service Commission of South Carolina, Docket No. 2019-290-WS, Evidentiary Hearings Transcript, pg. 720.

commissions have often requested this specifically. The recommended range and specific ROE for KIU is summarized in Table 5 on page 18.

**Q. PLEASE PROVIDE A SUMMARY OF HOW YOUR SPECIFIC ROE RECOMMENDATION FOR KIU COMPARES TO RETURN EXPECTATIONS OF MAJOR FINANCIAL INSTITUTIONS.**

**A.** My specific ROE recommendation of 7.47% for KIU is above the middle of the range of the expectations published by major banks and brokerage houses (4.1 to 8.9%) shown in Table 4 below. My recommendation is consistent with the COE demanded by investors and enable KIU to raise the capital needed to provide safe and reliable service.

TABLE 4: U.S. EQUITY RETURN EXPECTATIONS AMONG MAJOR FINANCIAL INSTITUTIONS	
Duff & Phelps (December 2021) [1]	8.0%
Horizon Actuarial Services, LLC Survey - 20 Year Horizon (August 2021) [2]	4.6 - 8.9%
50% Percentile: 6.9%	
J.P. Morgan Asset Management - Equity Long-Term Returns (Sep 2021) [3]	4.1%
Charles Schwab - 10-year U.S. Large Cap Returns (May 2021) [4]	6.6%

*Dates above indicate latest market-data used in analysis.*

Sources:

[1] Duff & Phelps, Cost of Capital in the Current Environment, COVID-19 Update - December 2021.

[2] Horizon Actuarial Services, LLC, Survey of Capital Market Assumptions Survey, August 2021, page 17.

Survey participants Include: Bank of New York Mellon, BlackRock, Goldman Sachs Asset Management, J.P. Morgan Asset Management, Merrill, Morgan Stanley Wealth Management, Royal Bank of Canada, UBS.

[3] J.P. Morgan Asset Management - 2022 Long-Term Capital Market Assumptions  
September 30, 2021, page 15.

[4] Charles Schwab - Why Market Returns May Be Lower and Global Diversification More Important in the Future  
May 3, 2021.

Table 4 above shows that major financial institutions are informing their clients to expect returns on their investments similar to the COE I propose in this testimony. The return expectations published by all these financial institutions are based on their own financial models and are broadly for the overall stock market (e.g., U.S. Large Cap, S&P 500). My ROE recommendation is based on government-regulated water utility companies only. Given the relatively low risk associated with monopoly utilities, it is unlikely that

investors would expect to earn a higher return for a utility company than for the overall stock market.

**Q. PLEASE COMPARE YOUR ROE RECOMMENDATION TO THE ROE IMPLIED BY KIU'S APPLICATION.**

**A.** KIU is requesting their rates be set based on the operating margin method and they did not provide rate of return testimony or a specific ROE request. However, according to KIU their requested 14.25% operating margin equates to an implied ROE request of 11.24%. The Company provides no justification for this 11.24% ROE and therefore there is no way for the Commission to determine if their requested 14.25% operating margin is appropriate or not. In my testimony I provide the Commission with the evidence it needs to evaluate if KIU's application will allow it to raise the capital it needs to provide safe and reliable service without overcharging consumers. My testimony focuses on using market data (e.g., stock prices, bond yields, stock option prices) to measure investors' expectations as much as possible.

As shown in Table 4 on page 9, KIU's implied 11.24% ROE request is considerably higher than return expectations published by major consulting firms, brokerage houses, and market data publications (4.1% - 8.9%).

KIU's witness Mr. Sorensen states that their requested operating margin of 14.25% is justified, in part, because of (1) the Company's high quality of service and operations, and (2) the high quality standards of their wealthy customers.

Consumers are not obligated to pay higher prices for utility services because they are wealthy enough to do so. KIU is obligated to provide safe and reliable service as cheaply as possible to all its customers. If KIU's customers "expect the highest of service

standards” as Mr. Sorensen claims, KIU has no right to earn a higher return on investment because of its customers’ quality of service expectations. Regardless, charging its consumers a higher return on investment than the current market rate for capital is not appropriate or necessary to assure capital is available and will result in an unjustified windfall to KIU. My market-based analysis indicates that the ROE I recommend for KIU is sufficient to attract capital because it is consistent with investors’ return expectations for the money they are providing for other investments of comparable risk.

State utility commissions, as well as the financial industry, have found that the COE of regulated water utility companies is significantly lower than KIU’s implied ROE request.

The implied ROE requested by KIU is also considerably above allowed returns in the following recent electric and water rate cases:

- **8.00%** - On December 21, 2021, the Public Service Commission of South Carolina authorized an ROE of 8.00% for Palmetto Wastewater Reclamation, Inc. (Docket No.2021-153-S – Order No. 2021-814).
- **7.90%** - On September 1, 2021, the Connecticut Public Utilities Regulatory Authority Public determined that effective November 1, 2021, Eversource’s authorized ROE will be 7.90%.<sup>12</sup>
- **7.46%** - On April 9, 2020, the Public Service Commission of South Carolina authorized a ROE of 7.46% for Blue Granite Water Company (Docket No. 2019-290-WS).<sup>13</sup> This decision was upheld by the South Carolina Supreme Court.<sup>14</sup>

<sup>12</sup> Docket No. 17-10-46RE03, Proposed Interim Decision, page 27.

<sup>13</sup> Docket No. 2019-290-WS – Order No. 2020-306, page 38.

<sup>14</sup> The Supreme Court of South Carolina, Opinion No. 28055, Heard June 15, 2021 – Filed September 1, 2021.

- 1           • **7.36%** - In Illinois Commerce Commission Docket No. 21-0365 Ameren Illinois  
2           proposed a 7.36% ROE in its formula rate update.<sup>15</sup> Formula rates set in Illinois  
3           based on a formulaic ROE calculation (current yield on 30-year U.S. Treasury plus  
4           580 basis points).
- 5           • **7.36%** - In Illinois Commerce Commission Docket No. 21-0367 ComEd proposed  
6           a 7.36% ROE in its formula rate update.<sup>16</sup> Formula rates set in Illinois based on a  
7           formulaic ROE calculation (current yield on 30-year U.S. Treasury plus 580 basis  
8           points).

9   **Q.   IS IT APPROPRIATE TO ALLOW KIU AN AUTHORIZED ROE BASED ON**  
10 **THOSE ALLOWED IN PAST CASES?**

11 **A.**   As explained below, KIU’s authorized ROE should be market-based. In other words, they  
12       should be based on investors’ return expectations as indicated by current market data. Even  
13       if it were assumed that all historical authorized ROEs of water utility companies in other  
14       jurisdictions are based on accurate market-based COE calculations, they are from the past.  
15       The COE should be based on current market conditions. Setting rates based on historical  
16       data is like driving a car by looking out the rear-view mirror. Calculating the COE while  
17       looking backward is particularly ineffective now because COVID-19 caused significant  
18       capital market disruption through most of 2020, and the recovery is happening in real time.  
19       Unless authorized ROEs are set based on investors’ current expectations as indicated by  
20       market data at the time of the proceeding, the resulting rates would either be too low to  
21       permit a utility to raise capital on reasonable terms or too high so that ratepayers would be

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<sup>15</sup> “Lowest equity return on record to be used in Ameren Illinois’ newest rate case,” RRA Regulatory Focus, April 16, 2021.

<sup>16</sup> “Fitch Rates Commonwealth Edison’s First Mortgage Bonds ‘A’”, Fitch Ratings, August 5, 2021.

overcharged. For these reasons, I strongly recommend using the results of my market-based methods as confirmed by the equity return expectations of leading financial institutions shown in Table 4 on page 9.

**Q. YOU MENTIONED ABOVE THAT SOME RECENT AUTHORIZED ROES HAVE BEEN BETWEEN 7.36% AND 8.00%. SHOULD THESE AUTHORIZED ROES GIVE THE COMMISSION COMFORT THAT YOUR RECOMMENDED ROE WILL ALLOW KIU TO RAISE THE CAPITAL REQUIRED TO PROVIDE SAFE AND RELIABLE SERVICE?**

**A.** Yes. As discussed above, it is encouraging for consumers and the general public that commissions are authorizing ROEs that are more in line with the market-based COE. Understandably, I have seen intense pushback from utility companies regarding these lower ROEs because it is their job to grow earnings as much as possible.

Should authorized ROEs continue to become more in line with the market-based COE, it is critical that we continue to analyze the data (e.g., stock prices, credit ratings) to ensure that utility companies have access to capital to provide safe and reliable service.

**Q. YOU RECOMMEND THAT KIU SHOULD BE AUTHORIZED TO EARN A RETURN ON EQUITY EQUAL TO THEIR MARKET-BASED COST OF EQUITY. PLEASE DEFINE THE COST OF EQUITY.**

**A.** The cost of equity or COE is the return investors expect to earn when they purchase the equity (or stock) of a company. The return investors expect can come in the form of capital gains (stock price appreciation) or dividend payments. As investors buy and sell stock in the market, they convey information about their return expectations and therefore the underlying cost of equity (companies with different risk profiles will have different costs

1 of equity). It is impossible to determine the cost of equity based on accounting information  
2 alone (e.g., revenue, net income, equity book value, or return on book equity) as it can only  
3 be established by the stock market.

4 It is important that the cost of equity used to set rates for KIU in this proceeding be  
5 market-based. This makes sense because investor-owned utility companies (“IOUs”) raise  
6 money from investors. It is thus critical that the authorized ROE be consistent with the  
7 market return expectations of investors. If the authorized ROE is below investors’ market  
8 return expectations, KIU will not be able to raise the capital required to provide safe and  
9 reliable service. On the other hand, if the allowed return is above investors’ market return  
10 requirements, KIU’s consumers will be paying more than necessary for their service.

11 **Q. DO ANY ROE WITNESSES USE A DIFFERENT DEFINITION FOR THE COST**  
12 **OF EQUITY?**

13 **A.** Yes. All ROE witnesses I have encountered over my more than 20 years in the industry  
14 define the cost of equity as market-based somewhere in their testimony. However, many  
15 of those witnesses, implicitly define the cost of equity, at least in part, as a hybrid of  
16 accounting returns (return on book equity) and return expectations of “expert forecasters”  
17 such as economists and equity analysts. For example, as discussed further below, many  
18 witnesses use Blue Chip interest rate forecasts instead of market-based bond yields as a  
19 proxy for the risk-free rate in their CAPM analyses. KIU did not file rate of return  
20 testimony and therefore did not provide a definition of the cost of equity. However,  
21 regardless of the Company’s definition of the cost of equity, their implied ROE request of  
22 11.21% is above the market-based cost of equity.



1 **Q. IS YOUR MARKET-BASED COST OF EQUITY RECOMMENDATION BASED**  
2 **ON YOUR OPINION OF FUTURE STOCK PRICE RETURNS?**

3 **A.** No. Capital markets are unpredictable and as explained above, it is investors' expectations  
4 that matter since they are the ones providing the capital. Therefore, I provide an expert  
5 evaluation of investors' return expectations as indicated by the current market prices of  
6 stocks, bonds, and stock options, without attempting to predict future prices. Current  
7 market prices reflect investors' expectations. This is an important topic that I will revisit  
8 throughout my testimony.

9 I do use Value Line and Zacks forecasts to estimate the market-based cost of equity  
10 in my Discounted Cash Flow (DCF) analyses. However, I do not use them mechanically  
11 and I go to great lengths to distill the sustainable growth component to ensure it is in line  
12 with investors' long-term expectations. My Capital Asset Pricing Model (CAPM) is based  
13 on a direct measurement of investors' expectations as indicated by market prices instead  
14 of analyst forecasts.

15 **Q. PLEASE SUMMARIZE HOW YOU DETERMINED YOUR COST OF EQUITY**  
16 **RECOMMENDATION.**

17 **A.** To arrive at my recommendation, I applied the Constant Growth and Non-Constant Growth  
18 versions of the DCF and 8 variations of the CAPM methodologies to a proxy group of 7  
19 publicly traded water utility companies ("RFC Water Proxy Group") using data available  
20 through January 31, 2022. To be conservative, I did not take into account the results of the  
21 Non-Constant Growth version of the DCF in arriving at my cost of equity recommendation  
22 because the results for several of the companies in my proxy group were below their cost  
23 of debt. As discussed below, I review capital market data in general and the model results

1 of leading financial institutions as an additional check on the reasonableness of my model  
2 results.

3 **Q. ARE YOUR COST OF EQUITY MODELS BASED ON ESTABLISHED**  
4 **METHODOLOGIES?**

5 **A.** Yes. The purpose of my testimony is to provide the Commission with an independent  
6 analysis. However, I do not reinvent the wheel. It is mostly a question of which established  
7 methodologies and theories are best to use. There are countless established methodologies  
8 and theories used by investors, scholars, and rate of return witnesses. Further, finance does  
9 not stand still and can be affected by numerous factors. For example, Wall Street traders  
10 have been increasingly using machine learning to make investment decisions, and the use  
11 of quantum computing is likely the next new tool.

12 The Constant Growth DCF model I use is the same one chosen by major financial  
13 institutions. For example, J.P. Morgan Chase uses the same sustainable growth form of  
14 the DCF method in its 2019 Long-Term Capital Market Assumptions publication.<sup>17</sup>  
15 *Principles of Corporate Finance*, a leading financial textbook used in business schools and  
16 investment banks around the world, recommends using the very same method I use to  
17 calculate the cost of equity for regulated utility companies.<sup>18</sup> As discussed in Section V.  
18 Capital Asset Pricing Model on page 60, my CAPM is based on methodologies used by  
19 Value Line, the Chicago Board of Options Exchange (CBOE), and published in peer-

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<sup>17</sup> 23rd Annual Edition, Long-Term Capital Market Assumptions - Time-tested projections to build stronger portfolios, pp. 62-63.

<sup>18</sup> Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 86-87.

1 reviewed academic journals (e.g., *The Review of Financial Studies*). My market-based cost  
2 of equity models have also been recognized by other state commissions.

3 On September 14, 2021, the Connecticut Public Regulatory Authority stated the  
4 following:

5 The Authority finds Rothschild’s market-based approach for determining a  
6 reasonable ROE to be credible and persuasive. Specifically, the Authority  
7 finds that the incorporation of investor market return expectations into the  
8 historically applied DCF and CAPM methodologies enables the Authority,  
9 and all docket participants, to better consider a just and reasonable rate of  
10 return based on the same prospective basis that base distribution rates are  
11 set. As such, the Authority determines that this added layer of analysis  
12 provides appropriate protection to the relevant public interests, both existing  
13 and foreseeable, pursuant to Conn. Gen. Stat. § 16-19e(a). Therefore, the  
14 Authority considered Rothschild’s DCF and CAPM calculations, as  
15 outlined below, in this Decision; moreover, on a going forward basis, the  
16 Authority shall consider a similar approach to incorporating investor  
17 expectations into the historically applied DCF and CAPM methodologies in  
18 all future rate proceedings.<sup>19</sup>

19 In California’s 2017 Water Cost of Capital proceedings, California Administrative  
20 Law Judge Bemserderfer recognized that a company witness acknowledged the validity of  
21 RFC’s method, stating the following:

22 ...on cross-examination Vilbert [California Water Service Company  
23 witness] admitted that Rothschild’s use of the method [b x r method] was  
24 “reasonable” and that Rothschild had “implemented the methodology  
25 correctly” in arriving at his Water Proxy Group ROE of 8.25%.<sup>20</sup>

26 On April 9, 2020, this Commission stated the following:

27 Amongst the three witnesses, Consumer Affairs Rothschild’s approach was  
28 unique in that he included the use of both historical and forward-looking,  
29 market-based data in his analysis. Based on the testimony and facts

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<sup>19</sup> Proposed Interim Decision of the Connecticut Utilities Regulatory Authority, Docket No. 17-10-03RE11, page 21, September 14, 2021.

<sup>20</sup> Proposed Decision of ALJ Bemserderfer, Application 17-04-001, Agenda ID #16274 Ratesetting, page 19, February 6, 2018.

presented, the Commission therefore adopts the recommended ROE of 7.46% proposed by witness Rothschild.<sup>21</sup>

**Q. PLEASE SUMMARIZE THE RESULTS OF YOUR COST OF EQUITY MODELS.**

**A.** I have determined the cost of equity or COE for the average company in my RFC Water Proxy Group to be between 6.78% and 8.16%.<sup>22</sup> As shown in Table 5 below, the high-end results of my COE models, including eight variations of the CAPM, range between 5.80% and 8.27%, with an upper quartile at 8.16%. The low-end results of my COE models range between 5.75% and 8.15%, with a lower quartile at 6.78%.

<b>TABLE 5: COST OF EQUITY MODEL RESULTS</b>		
<b>DCF</b>	<b>Low</b>	<b>High</b>
Constant Growth	8.15%	8.27%
Non-Constant Growth (Excluded from Recommendations)	5.75%	5.80%
<b>CAPM</b>		
<b>Spot (Jan. 31, 2022)</b>		
Risk Free Rate - 3-Month T Bill	6.39%	7.47%
Risk Free Rate - 30-Yr T Bond	7.17%	8.05%
<b>3-Mo. Weighted Average (Nov. 2021 to Jan. 2022)</b>		
Risk Free Rate - 3-Month T Bill	7.29%	7.55%
Risk Free Rate - 30-Yr T Bond	7.81%	8.02%
<b>Outer Quartile Range</b>	<b>6.78%</b>	<b>8.16%</b>
<b>Midpoint of Range</b>	<b>7.47%</b>	

Exhibit ALR-2

**Q. WHAT DOES CAPITAL MARKET DATA INDICATE REGARDING HOW THE COVID PANDEMIC HAS AND IS INFLUENCING THE COST OF EQUITY?**

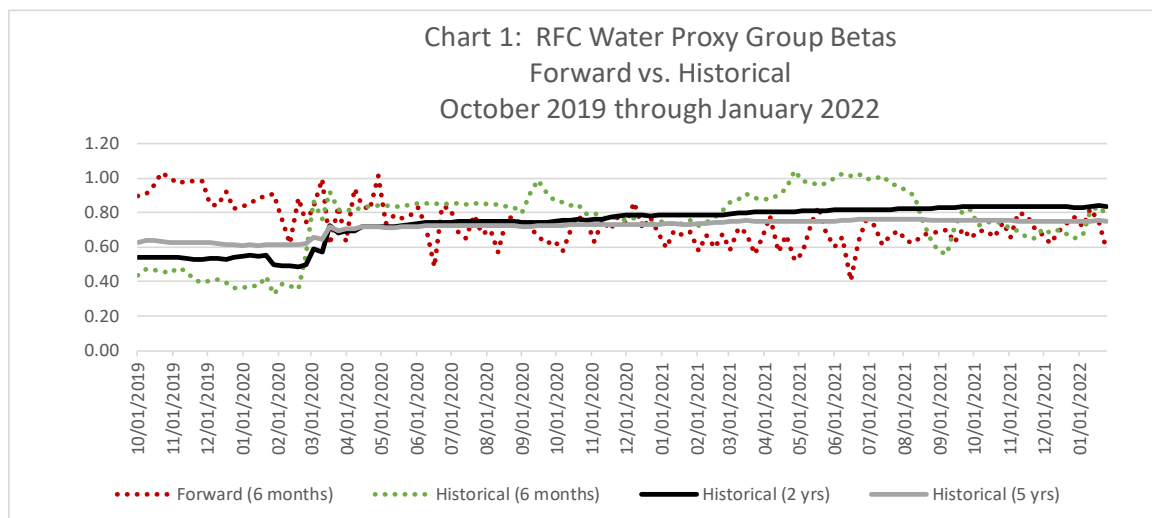
**A.** Market data show that in the early stages of the COVID pandemic, capital market risks increased but have since declined to approximately pre-pandemic levels, as elaborated upon below.

<sup>21</sup> Order Ruling on Application for Adjustment in Rates, Blue Granite Water Company, Docket No. 2019-290-WS, Order No. 2020-306, April 9, 2020, page 43.

<sup>22</sup> Exhibit ALR-2.

**Q. PLEASE EXPLAIN WHAT MARKET DATA SHOW REGARDING HOW INVESTORS' PERCEPTION OF WATER UTILITY EQUITY RISK WAS IMPACTED BY THE COVID PANDEMIC.**

**A.** Financial data (as elaborated upon in Section IV starting on page 24) indicate that the capital market upheaval of March 2020, including its impact on water utility companies' cost of equity was brief. Although stock and bond prices remain more volatile than before COVID-19, market data show that investors' volatility expectations have declined for both the overall market and water utility companies since mid-March 2020. As shown on Chart 1 below, forward-looking option-implied betas<sup>23</sup> for the RFC Water Proxy Group are lower now than before the pandemic. The average option-implied beta of the RFC Water Proxy Group for the last quarter of 2019 was 0.93, while the average for the three months ending January 31, 2022 was 0.72. With all other factors being equal, this would indicate that KIU's cost of equity is lower now than it was before the pandemic.



<sup>23</sup> As discussed below, beta is a measure of a security's sensitivity to movements in the overall market. A beta of 1 indicates a COE equal to the overall market while a beta higher or lower than 1 indicates a COE higher or lower than the overall market respectively.

1           Table 6 on page 21 shows a summary of how COVID-19 has impacted financial  
2           markets between December 31, 2019, and January 31, 2022. Line 1 of Table 6 shows how  
3           the overall stock market (S&P 500) sharply declined during the initial spread of COVID-  
4           19, but has fully recovered and is regularly reaching new highs. Line 2 shows that interest  
5           rates initially declined sharply (30-year U.S. Treasury yields fell from 2.39% to 1.41% on  
6           June 20, 2020)<sup>24</sup>, bounced back by March 2021, and have since once again gone down and  
7           remained below pre-pandemic levels (2.11% as of January 31, 2022). As shown on line 3,  
8           in March through December 2020, investors were demanding an increased credit spread to  
9           invest in riskier corporate bonds (151 basis point increase from December 2019 to March  
10          2020), but credit spreads have since come down to below pre-pandemic levels (1.93% as  
11          of January 31, 2022 vs. 1.98% as of December 31, 2019). Line 4 shows that investors'  
12          volatility expectations as measured by the Market Volatility Index (VIX) increased  
13          significantly from 13.78 on December 31, 2019 to 75.91 in March 2020 but have since  
14          come back down considerably to 24.83 as of January 31, 2022. Line 5 shows that stock  
15          option prices indicate that the equity risk premium, which also peaked in March and April  
16          2020, has since come down but remains somewhat elevated when compared to pre-  
17          pandemic levels. Lastly, as shown on line 6 of Table 6 and Chart 1 on page 19, option-  
18          implied betas for my RFC Water Proxy Group, which peaked in February 2020, have since  
19          decreased to levels below those before the pandemic (0.59 on January 31, 2022 vs. 0.84 on  
20          December 31, 2019), indicating that investors expect water utility stock price movements  
21          to be less correlated with the overall market than before the pandemic and therefore to be  
22          less risky relative to the market.

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<sup>24</sup> The yield on the 30-year U.S. Treasury bond reached a low of 1.17% on April 24, 2020.

**TABLE 6: COST OF EQUITY IN TODAY'S FINANCIAL MARKET - SUMMARY**  
**MEASURING COVID-19'S IMPACT ON THE COST OF EQUITY**

	31-Dec-19	19-Feb-20	17-Mar-20	30-Jun-20	31-Dec-20	30-Jun-21	31-Dec-21	31-Jan-22	
	Pre-Covid	COVID-19 Crisis							Dec '19 - Jan '22 Delta
		Mkt Peak	Trough	"Recovery"					
1. Stock Prices (S&P 500)	\$3,230.78	\$3,386.15	\$2,529.19	\$3,100.29	\$3,756.07	\$4,297.50	\$4,766.18	\$4,515.55	\$1,284.77
Growth Since 12/31/19		4.8%	-21.7%	-4.0%	16.3%	33.0%	47.5%	39.8%	
2. Interest Rates (30-Yr) [1]	2.39%	2.01%	1.63%	1.41%	1.65%	2.06%	1.90%	2.11%	-0.28%
3. Credit Spreads (Baa vs. 10-Yr) [2]	1.98%	2.05%	3.49%	2.93%	2.18%	1.87%	1.85%	1.93%	-0.05%
4. Volatility Expectations (30-Day) [3]	13.78	14.38	75.91	30.43	22.75	15.83	17.22	24.83	11.05
5. Market Risk Premium [4]	4.59%	4.95%	10.07%	9.03%	8.48%	6.87%	8.55%	8.61%	4.02%
6. RFC Water Proxy Group - Fwd. Beta (6-Mo.) [5]	0.84	0.89	0.62	0.82	0.67	0.75	0.78	0.59	-0.25

[1] 30-year U.S. Treasury Yield

[www.treasury.gov](http://www.treasury.gov)

[2] Baa rated corporate bond yield - 10-year U.S. Treasury Yield

<https://fred.stlouisfed.org/series/BAA>

<https://fred.stlouisfed.org/series/GS10>

[3] VIX Index - 30 days

[4] Annualized option-implied market risk premium vs. 30-year Treasury RFR - weighted across all traded expirations

as of last Tuesday before date, assuming 50.0% cumulative probability (median)

[5] Option-implied beta - 6-month, as of last Tuesday before date

Exhibit ALR-4

**Q. PLEASE DEFINE YOUR ANALYTICAL APPROACH?**

**A.** My COE recommendation is my opinion of the return investors require to provide equity capital to KIU based on current capital markets. My recommendation is consistent with the following legal standards set by the United States Supreme Court for a fair rate of return:

The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks.<sup>25</sup>

And

...sufficient to...support its credit and...raise the money necessary for the proper discharge of its public duties.<sup>26</sup>

<sup>25</sup> *Federal Power Commission v. Hope Natural Gas Company* 320 U.S. 591, 603 (1944).

<sup>26</sup> *Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia* 262 U.S. 679, 692-693 (1923).

1 Because the cost of equity is not a published figure like a bond yield, some  
2 interpretation is required to determine the appropriate market price. My COE  
3 recommendation is based on my computation of what the market indicates investors require  
4 (return on investment) to provide capital to companies with comparable risk to KIU.

5 As explained below, I use current market prices (e.g., stocks, bonds, options), which  
6 measure investors' expectations directly, to determine the cost of equity, instead of relying  
7 solely on historical data and analyst forecasts.

### 8 **III. CAPITAL STRUCTURE AND COST OF DEBT**

9 **Q. WHAT IS CAPITAL STRUCTURE?**

10 **A.** The capital structure of a company is the percentage of debt (long-term and short-term)  
11 and equity used to finance its assets and operations.

12 **Q. PLEASE DEFINE THE COST OF DEBT.**

13 **A.** The cost of debt is the interest rate a utility pays on its bonds and loans.

14 **Q. PLEASE EXPLAIN HOW CAPITAL STRUCTURE, COST OF DEBT, AND COST**  
15 **OF EQUITY RELATE TO A UTILITY COMPANY'S AUTHORIZED RATE OF**  
16 **RETURN?**

17 **A.** As discussed above, the appropriate ROR is based upon the weighted average cost of debt  
18 and equity at the time of this proceeding.



1 **Q. WHAT CAPITAL STRUCTURE AND COST OF DEBT DO YOU RECOMMEND**  
2 **BE USED FOR KIU’S OVERALL COST OF CAPITAL?**

3 **A.** I recommend using a capital structure that comprises 49.86% common equity and 50.14%  
4 long-term debt based on the average capital structure of my proxy group of 7 water utility  
5 companies. I recommend a cost of long-term debt of 3.39% based on the interest rate of  
6 unsecured notes issued by Southwest Water Company in October 2020 that mature in  
7 2050.<sup>27</sup>

8 **Q. WHAT CAPITAL STRUCTURE AND COST OF DEBT IS KIU REQUESTING?**

9 **A.** As stated above, KIU is requesting its rates be set based on the operating margin method  
10 instead of the rate base method. Therefore, it is not requesting specific capital structure or  
11 cost of debt for ratemaking purposes. However, KIU’s requested operating margin of  
12 14.25% has an implied capital structure comprised of 53.20% common equity and 46.80%  
13 long-term debt.<sup>28</sup> KIU indicates a cost of debt of 4.57% based on an intercompany loan  
14 agreement between KIU and Southwest Water Company dated June 1, 2018.<sup>29</sup>

15 **Q. WHY ARE YOU ARE RECOMMENDING A DIFFERENT CAPITAL**  
16 **STRUCTURE THAN IMPLIED BY KIU’S REQUESTED 14.25% OPERATING**  
17 **MARGIN?**

18 **A.** I am recommending the average capital structure ratios of the companies in my proxy group  
19 to be used for KIU because they did not provide any justification for their implied capital  
20 structure. The cost of equity is more expensive than the cost of debt. Therefore, if KIU’s

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<sup>27</sup> KIU’s confidential response to DCA 1-15e. Information provided with consent of KIU.

<sup>28</sup> KIU’s Application, Schedule A.

<sup>29</sup> KIU response to ORS 6-21 b. Exhibit ALR-6.

1 implied capital structure, which has a higher common equity ratio than the average of the  
2 companies in my proxy group, is used to set rates, consumers will pay more. If KIU is able  
3 to explain why it is in the best interest of consumers for it to have a higher common equity  
4 ratio than that used by the publicly traded water utilities in my proxy group then that  
5 evidence should be considered.

6 **Q. PLEASE EXPLAIN WHY YOU ARE RECOMMENDING A 3.39% COST OF**  
7 **DEBT?**

8 **A.** I am recommending the cost rate of 3.39% of the unsecured notes issued by KIU's parent  
9 Southwest Water Company in October 2020 instead of the 4.57% rate on the loan  
10 agreement dated September 2018 because KIU has an obligation to provide safe and  
11 reliable services as cheaply as possible. There is no justification for KIU to continue to  
12 pay a higher interest rate than Southwest Water Company's current cost of debt because  
13 the loan agreement between KIU and its parent does not have a prepayment penalty. A  
14 rational homeowner would refinance his mortgage if interest rates decreased this much and  
15 KIU is obligated to refinance if it would save its consumers money.

#### 16 **IV. COST OF EQUITY IN TODAY'S FINANCIAL MARKETS**

17 **Q. HOW DO RECENT FINANCIAL MARKET DEVELOPMENTS AFFECT THE**  
18 **COST OF EQUITY?**

19 **A.** The spread of COVID-19 significantly impacted the global economy and has tragically  
20 taken millions of lives, but the cost of equity for water utilities has not been significantly  
21 impacted. During the initial phases of the pandemic in early 2020 stock prices became

1 much more volatile in the U.S. and around the world, but by mid-August 2020, the S&P  
2 500 had already fully recovered, consistently reaching new highs through the end of  
3 January 2022. The unemployment rate increased to nearly 15% in April 2020, but quickly  
4 recovered and is 4% as of January 2022.<sup>30</sup> In the first and second quarters of 2020, real  
5 gross domestic product fell sharply. In response, the Federal Reserve cut short-term  
6 Treasury yields to 0% and began purchasing \$120 billion per month of long-term Treasury  
7 and corporate bonds. Congress passed multiple stimulus packages worth trillions of  
8 dollars. The combination of the pandemic's impact on the economy and the government  
9 actions in response have led to historically low interest rates and a lower cost of debt for  
10 corporations, including regulated utility companies. The pandemic's impact on the cost of  
11 equity is more complicated than its impact on debt.

12 **Q. PLEASE DISCUSS SOME RECENT MARKET DEVELOPMENTS THAT**  
13 **IMPACT THE COST OF EQUITY.**

14 **A.** Below I will discuss in more depth the data presented in Table 6 on page 21. It is important  
15 to consider the results of my COE models (DCF and CAPM) in the context of current  
16 financial market conditions as follows:

- 17 1. **Stock prices crashed and have more than recovered.** The S&P 500, Dow Jones  
18 Industrial Average, and other stock indices fell faster in the second half of March  
19 2020 than during the 2007-2008 financial crisis, the crash of 1987, and the Great  
20 Depression. As of March 23, 2020, the S&P 500 had fallen approximately 34%  
21 from its high reached on February 19, 2020. On August 18, 2020, the S&P 500 set  
22 a new high, which represents the fastest recovery (126 trading days) from a bear

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<sup>30</sup> <https://fred.stlouisfed.org/series/UNRATE>.

1 market. Water utility stocks initially fell slightly less than the overall market (about  
2 26% off their peak versus 34% for the S&P 500) and while they have lagged the  
3 market's recovery since, they have still surpassed pre-pandemic stock prices on  
4 average.

5 2. **Interest rates reached record lows during the pandemic and investors expect**  
6 **long-term interest rates to remain historically low.** The yield on 30-year U.S.  
7 Treasury bonds remains below what it was before the pandemic – the average yield  
8 was 2.10% in January 2022 compared to an average yield of 2.22% in January 2020,  
9 before the pandemic started to significantly impact capital markets.<sup>31</sup> There is a lot  
10 of speculation in the news regarding the possibility that recent spikes in inflation  
11 will remain and impact capital markets, including interest rates. Inflation may or  
12 may not be high in the future, but for the purposes of this proceeding, what matters  
13 most is investors' expectations, not the speculations of journalists and economists.  
14 Market-data also indicates that investors expect inflation to be transitory. As shown  
15 on Chart 5 on page 34, the relative market price of inflation protected bonds as  
16 compared to regular Treasury bonds indicates that investors expect inflation to be  
17 only about 2.5% over the next 5 years and about 2.3% over the next 30-years.<sup>32</sup>

18 3. **Credit spreads increased sharply during the initial phase of the pandemic, but**  
19 **quickly declined and are now below pre-pandemic levels.** The spread between  
20 the yield investors demand to purchase U.S. corporate bonds and U.S. Treasury  
21 bonds (see Chart 6 on page 35) increased significantly in the initial phases of the  
22 COVID-19 pandemic, but never got as high as it did during the financial crisis of

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<sup>31</sup> Chart 3 on page 31.

<sup>32</sup> Chart 5 on page 34.

2007-2008. As of January 31, 2022, the yield spread for Baa credit-rated corporate bonds is 1.93%, below pre-pandemic levels of 1.98% on December 31, 2019, after reaching a high of over 4.00% in March 2020.<sup>33</sup> Credit spreads can be used as a gauge of the cost of equity because, all else equal, when investors demand a lower spread to take on the risk of corporate bonds versus U.S. Treasury bonds they will demand a lower spread to invest in the equity of corporations. Therefore, credit spread data shows additional evidence that the cost of equity has not been materially impacted by the pandemic and is likely a little bit lower than before the pandemic.

**4. Investors' stock price volatility expectations have fallen from highs reached during initial phases of the pandemic.** In March 2020, the VIX Index reached levels not seen since the financial crisis of 2007-2008, and even set all-time records.<sup>34</sup> Volatility expectations remain higher than before COVID-19 but have declined significantly since peaks reached in March 2020.

**5. RFC Water Proxy Group Option-Implied 6-month Betas have decreased.** As discussed in depth in the CAPM section below, stock option data indicate that investors expect water utility stock price movements to be less correlated to the overall market. All else equal, a lower beta indicates a lower cost of equity.

I elaborate on each of the points above in the following sections.

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<sup>33</sup> Chart 6 on page 35.

<sup>34</sup> Chart 8 on page 38.

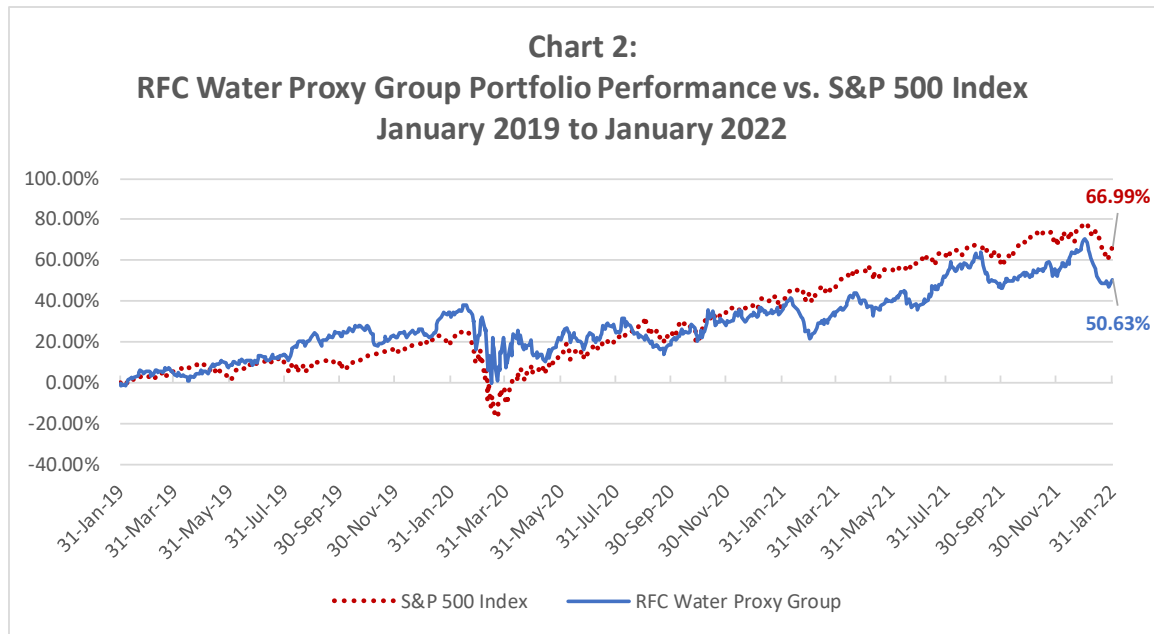
**A. Stock Price Trends**

**Q. WHAT, IF ANYTHING, DOES STOCK MARKET DATA INDICATE WITH REGARD TO THE COST OF EQUITY?**

**A.** As stock prices have shown an overall increase between 1926 and 2020, price-to-earnings (P/E) ratios have increased significantly as well.<sup>35</sup> This indicates that the cost of equity may be decreasing along with the higher stock prices because investors are paying a higher price for the same earnings. For example, an investor paying \$100 for a share of a stock with \$10 per year of earnings will earn a 10% annual return, assuming no growth. If this stock goes up to \$200 per share, the annual earnings decrease to 5%. As shown in Chart 2 on page 29, stock prices for the S&P 500 and the RFC Water Proxy Group increased significantly in the nearly 3.0 years since KIU's last application to file proposed changes in rates on January 31, 2019.<sup>36</sup> After the significant losses due to COVID-19 in March 2020, the S&P 500 Index and the stock prices for the RFC Water Proxy Group have fully recovered and are up nearly 66.99% and 50.63% as of January 31, 2022, respectively. However, the relative stock price performance of water utility stocks is just one piece of a multi-dimensional puzzle that we must construct to measure the cost of equity. As discussed throughout this testimony, betas, credit spreads, and other measures of risk and investors' expectations indicate that the cost of equity for KIU has not been materially impacted as a result of the pandemic.

<sup>35</sup> Duff & Phelps, 2021 SBBI Yearbook, Page 10-28.

<sup>36</sup> Docket No. 2018-257-WS.



## **B. Interest Rates and Inflation**

**Q. PLEASE DISCUSS THE CURRENT INTEREST RATE ENVIRONMENT AND WHAT IT INDICATES REGARDING THE COST OF EQUITY.**

**A.** Two significant interest rate developments occurred in response to COVID-19. First, interest rates have fallen significantly since the beginning of COVID-19. Short-term interest rates are now near 0%. As shown on Chart 3 on page 31, yields on 30-year U.S. Treasuries have fallen from 2.39% as of December 31, 2019 to 2.11% as of January 31, 2022. Federal Reserve officials signaled they are on track to raise its short-term interest rate target in March 2022 and as of January 14, 2022 market prices indicate that collectively investors believe there is a 96.9% chance they will do so.<sup>37</sup> The actions of the Federal Reserve can impact the cost of equity because if it increases short-term interest rates it can cause long-term interest rates (e.g., 30-year U.S. Treasury bonds, 10-year Corporate bonds)

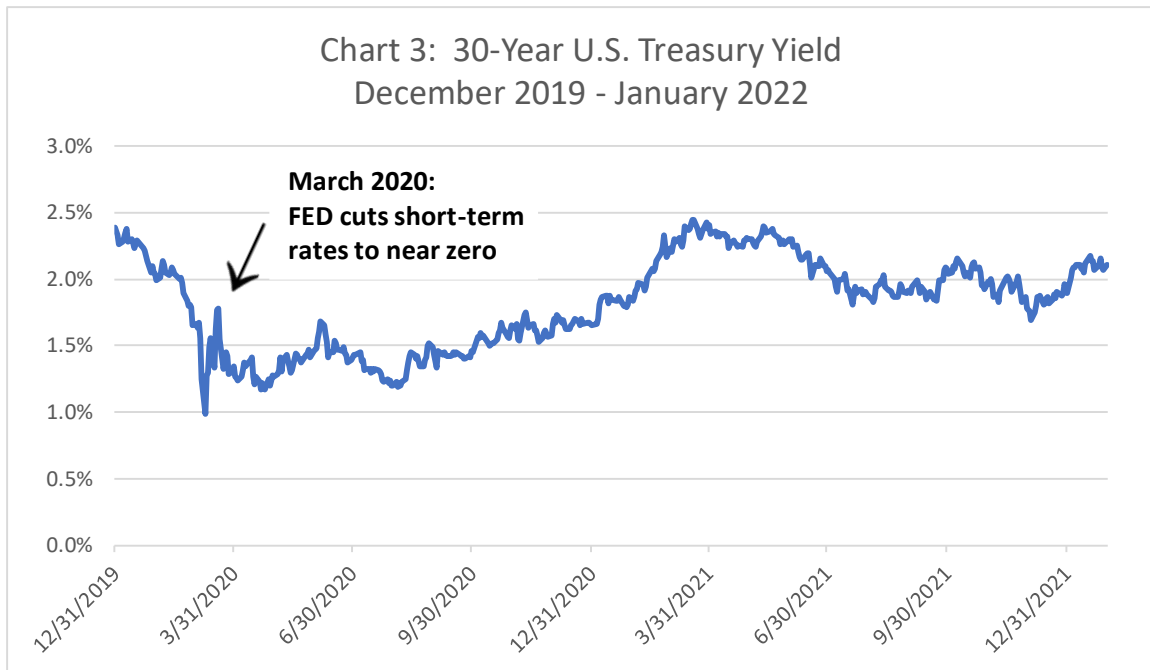
<sup>37</sup> CME FedWatch Tool.

1 and the returns demanded by investors to purchase equity in general and water utility stocks  
2 in particular to increase. Despite statements by the Federal Reserve declaring that it might  
3 start reducing its bond purchasing program sooner than expected, long-term interest rates  
4 remain historically low and therefore the cost of equity has likely not been impacted. When  
5 the Federal Reserve began to ease its “easy-money” policies back in 2013, the resulting  
6 increase in interest rates was called a “Taper Tantrum.” This time around, the declining  
7 interest rates in response to the Federal Reserve’s potential policy changes are being called  
8 a “Taper Tranquility.”<sup>38</sup> Lower interest rates indicate a lower cost of equity for water utility  
9 companies because many bond investors sell bonds and purchase utility stocks as interest  
10 rates decline. If interest rates should increase in the future it’s possible KIU’s cost of equity  
11 will increase, but it would not be fair to charge consumers today for the possibility that the  
12 cost of equity will increase. If interest rates increase KIU can file another application at  
13 that time.

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<sup>38</sup> Why There Is No ‘Taper Tantrum’ This Time Around, WSJ, June 22, 2021.





**Q. HOW DO YOU RESPOND TO PEOPLE WHO CLAIM THAT INTEREST RATES ARE ABOUT TO INCREASE?**

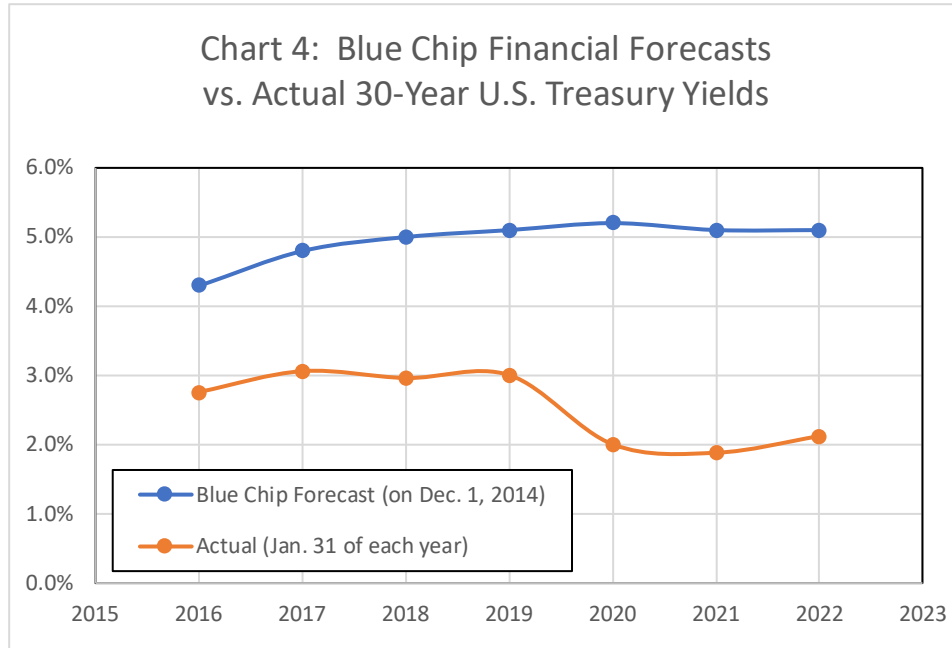
**A.** It is important to recognize that current long-term Treasury bond yields represent a direct observation of investor expectations and there is no need to use “experts” to determine market-based cost of equity.

Many economists and forecasters will continue to be quoted in the press prognosticating on possible developments that are truly unpredictable. The Nobel Laureate Economist Daniel Kahneman stated the following regarding forecasting:

It is wise to take admissions of uncertainty seriously, but declarations of high confidence mainly tell you that an individual has constructed a coherent story in his mind, not necessarily that the story is true.<sup>39</sup>

As Chart 4 below shows, Blue Chip Financial forecasted in 2014 that 30-Year U.S. Treasury bonds would be over 5% by 2018 while in fact they turned out to be under 2%.

<sup>39</sup> Daniel Kahneman, *Thinking Fast and Slow* (2011) at p. 212.



The time covered in Chart 4 above was chosen to provide a concrete example. Blue Chip’s interest rate forecasts have been persistently inaccurate. A paper published by the Congressional Budget Office determined Blue Chip consensus forecasts exhibited “significant positive bias” between 1984 and 2012 and “have become more biased and less accurate over time.”<sup>40</sup> Interest rates may or may not turn out to be transitory, but it is safe to say interest rates are unpredictable.

**Q. PLEASE DISCUSS THE CURRENT INFLATION ENVIRONMENT AND WHAT IT INDICATES REGARDING THE COST OF EQUITY.**

**A.** The Federal Reserve stated it plans to increase short-term interest rates and unwind its purchase of bonds in order to fight potential increases in inflation. Therefore, higher

<sup>40</sup> Congressional Budget Office, Edward N. Gamber, *Did Treasury Debt Markets Anticipate the Persistent Decline in Long-Term Interest Rates?* (September 2017) at p. 2, available at: <https://www.cbo.gov/system/files/115th-congress-2017-2018/workingpaper/53153-interestrateswp.pdf>.

inflation could possibly impact the cost of equity because it can impact interest rates. Inflation has increased substantially recently and there is a lot in the news regarding if inflation will continue to rise and how much it could impact the economy, including capital markets and the cost of equity. As stated throughout this testimony, the cost of equity should be based on investors' return expectations because they are the ones providing the capital.

**Q. IS THERE A WAY TO MEASURE INVESTORS' INFLATION EXPECTATIONS DIRECTLY?**

**A.** Yes. It is possible to measure investors' inflation expectations directly simply by subtracting the interest rate of nominal Treasuries and TIPS (Treasury Inflation -Protected Securities) of comparable matures. This difference is referred to as the "breakeven inflation rate" because it represents what inflation would have to be for an investor to "break even" or make the same return on both nominal Treasuries and TIPS. For example, if the yield on a nominal 10-year Treasury is 2.5% and TIPS of the same duration are 1.5%, an investor would make the same real return on both bonds if the inflation rate is 1% over the next 10 years.

Nominal yield – real yield = breakeven inflation rate

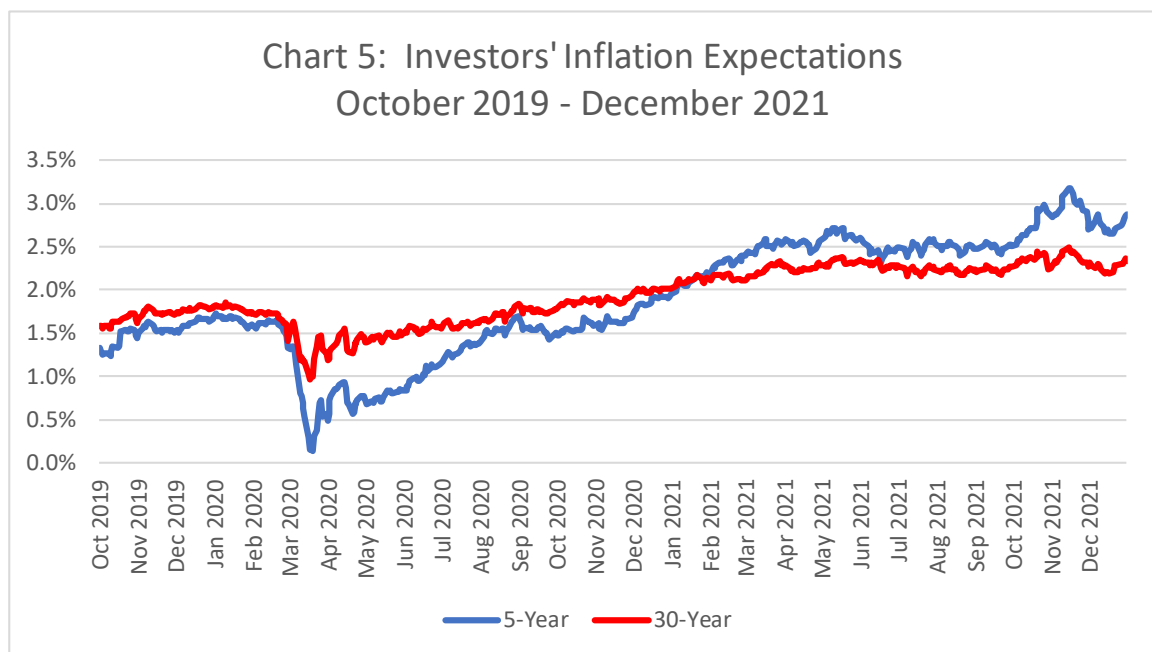
In this case, investors breakeven inflation rate is 1% (2.5% - 1.5%) = 1%

It makes sense that investors' inflation expectation is equal to the breakeven inflation rate because if investors, on average, believed that inflation was going to be lower than 10%, in the example above, they would purchase TIPS and expect to make exceptional profits. The investor who purchases TIPS would earn 1.5% + 10% inflation = 11.5%. The investor who purchased the nominal Treasury would only earn a 2.5% return. With such

large relative returns to be made buying TIPS in this hypothetical example, investors would bid up the price of TIPS and drive down the yield until investors expect the same real return on nominal Treasures and TIPS.

**Q. WHAT DOES MARKET DATA INDICATE REGARDING INVESTORS CURRENT INFLATION EXPECTATIONS?**

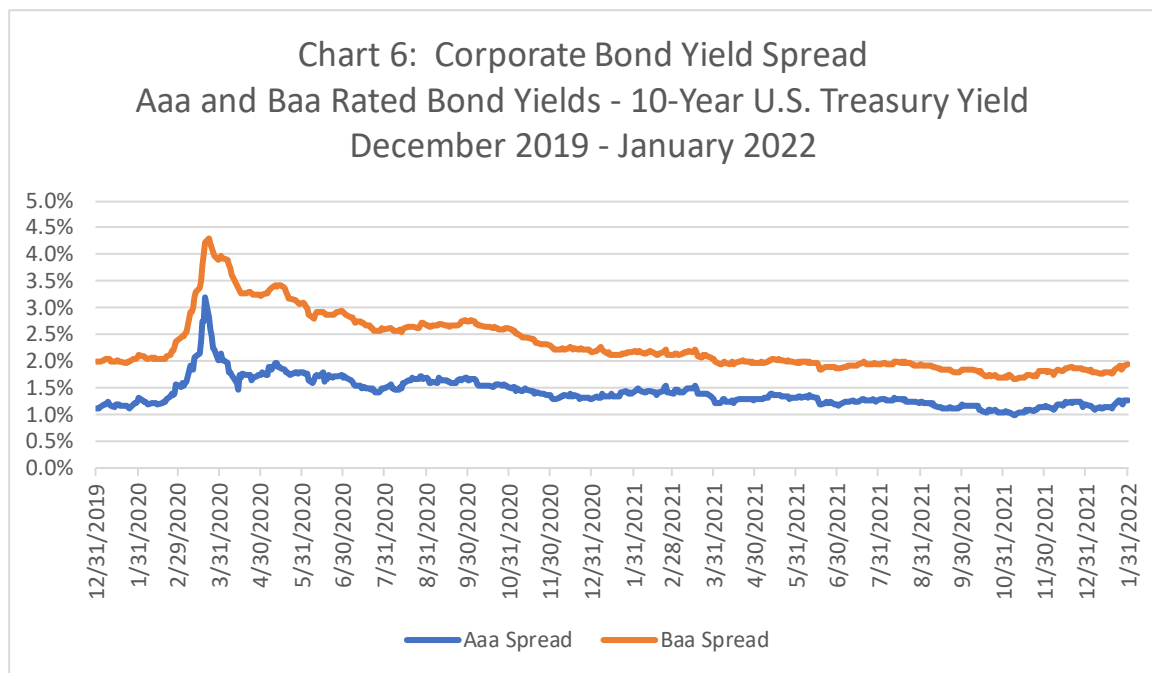
**A.** As indicated by the difference between nominal-treasures and TIPS, investors inflation expectations decreased substantially during the height of COVID's impact on capital markets. See Chart 5 below. In March 2020, investors expected the inflation rate over the next 5-years to be as low as 0.1% and approximately 1% over the 30-year timeframe. As of December 31, 2021, investors expected the inflation rate over the next 5-years to be 2.9% and 2.3% over the 30-year timeframe. Inflation may or may not increase more than expected by investors, but if it does KIU can apply for a rate increase at that time.



### C. Credit Spreads

**Q. WHAT DOES AN INCREASING CREDIT SPREAD MEAN FOR THE COST OF EQUITY?**

**A.** As shown in Chart 6 below, the yield spread between Corporate bonds and Treasury bonds increased significantly as the Coronavirus has spread throughout the world. The interest rate spread between Baa Corp bonds and 10-year U.S. Treasuries peaked at over 4% in mid-March 2020. This chart clearly shows that yield spreads have declined since their peak to pre-pandemic levels. As of January 31, 2022, the yield spread between Baa Corp bonds and 10-year U.S. Treasuries is 1.93%, more than 200 basis points lower than the peak reached in March 2020 and even lower than before the pandemic. A declining yield spread indicates that investors' appetite for risk has increased since mid-March 2020. As investors' appetite for risk increases, the cost of equity tends to decline.



**D. Volatility Expectations**

**Q. PLEASE DISCUSS CURRENT STOCK PRICE VOLATILITY EXPECTATIONS AND WHAT THEY INDICATE REGARDING THE COST OF EQUITY.**

**A.** Volatility, uncertainty, and risk are synonymous. There are two primary types of volatility: “realized volatility” and “implied volatility.” The former is based on historical returns, which may or may not represent future volatility. On the other hand, implied volatility is calculated from options data, which indicates investors’ future expectations for volatility. As discussed below, the “term structure” of volatility indicates investors’ volatility expectations over different forward-looking time periods (e.g., 1-month, 1-year).

**Q. PLEASE EXPLAIN THE “TERM STRUCTURE OF VOLATILITY.”**

**A.** Investors can expect volatility to increase or decrease over time. Even during the height of a crisis, investors often expect volatility to decrease in coming months or years. In other words, investors expect the current capital market hurricane to pass and the winds to die down. In general (i.e., in “normal” financial markets), investors expect higher volatility for longer time horizons. For example, investors generally expect the chance stock prices will increase or decrease by 10% in 1 year (on an annual basis) to be greater than the chance of a 10% move over the next 30 days (on an annual basis). This makes sense because there is more uncertainty regarding economic and stock market changes the further into the future you look.

However, during the peak of implied volatility (to date) in mid-March 2020, shortly after the World Health Organization declared COVID-19 a pandemic, the data indicated that investors expected stock price volatility to decrease over time. This implies that investors expected the riskiness of equity investments to decrease over time. As shown in

Chart 7 below, before the COVID-19 outbreak, investors expected volatility to increase from less than 15% annually at the 1-month time frame to about 20% annually at the 24-month time frame. At the peak of the COVID-19 outbreak in March 2020, investors expected volatility to decrease from over 70% at the 1-month time frame to about 38% at the 24-month time frame.

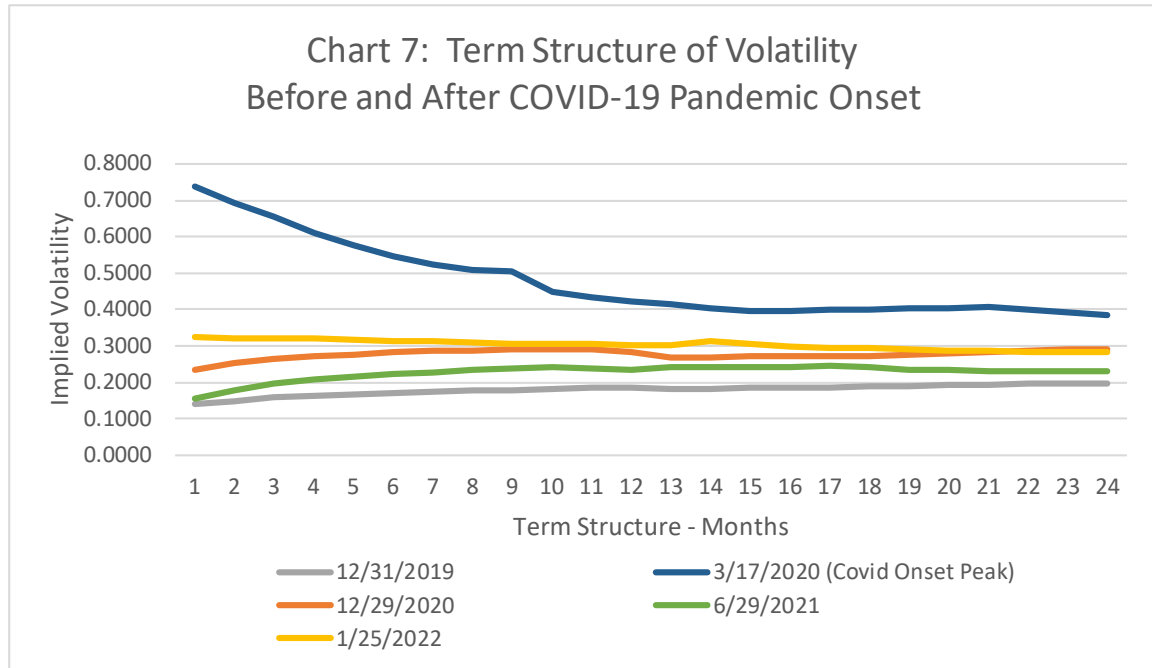
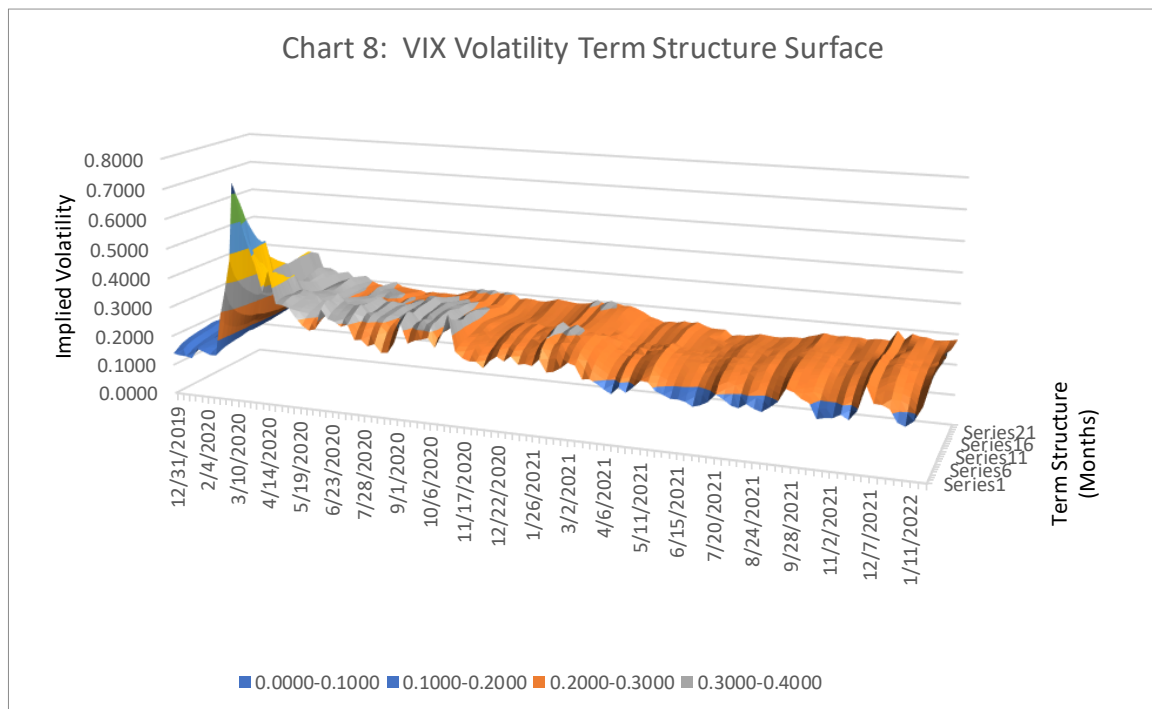


Chart 8 on page 38 provides a 3-dimensional surface<sup>41</sup> to show how the term-structure of volatility has evolved since before the COVID-19 outbreak and how it has changed during and since the outbreak. Chart 7 above is simply selected cross sections of the same data in the surface in Chart 8. In the surface, one can see that on December 31, 2019, the term structure of volatility is almost flat, increasing slightly from the 1-month to the 24-month time frame. In mid-March 2020, the implied volatility increased over every time period in comparison to December 31, 2019, but one can see that investors expected

<sup>41</sup> The X axis shows the implied volatility. The Y axis shows the data. The Z axis shows market expectation of future implied volatility of different time frames. Series1 = 1 month and Series24 = 24 months.

a declining term structure of volatility. By the end of July 2020, the implied volatility for all time periods had decreased, and the declining term structure moved to a more typical structure in which investors expected higher volatility over longer time periods, as it remains as of January 25, 2022. In late November 2021, the implied volatility increased as the Omicron variant rapidly spread throughout the world, but by the end of December 2021, implied volatility returned to pre-Omicron levels.



A declining term structure of volatility is important data to consider in determining the appropriate cost of equity for KIU because it shows that investors expected risk to decline during the peak of the pandemic's impact on financial markets. Lower risk means a lower cost of equity. Investors' market volatility expectations turned out to be correct. In March 2020, investors expected implied volatility to decline considerably over the next 12 to 24 months, and it has.



1 **Q. HOW HAVE VOLATILITY EXPECTATIONS FOR WATER UTILITY**  
2 **COMPANIES COMPARED TO VOLATILITY EXPECTATIONS FOR THE S&P**  
3 **500?**

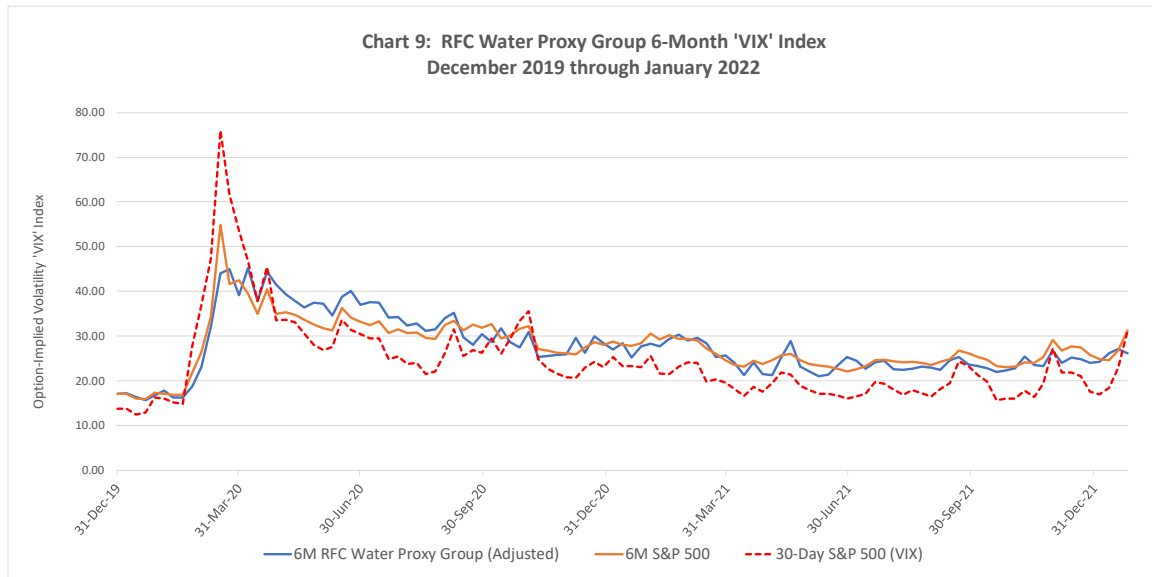
4 **A.** The blue line in Chart 9 on page 40 shows that investors' adjusted<sup>42</sup> 6-month volatility  
5 expectations for my RFC Water Proxy Group, as indicated by their stock option prices,  
6 increased along with the market (orange line) in mid-March 2020, but to a significantly  
7 lesser degree. Investors' 6-month adjusted volatility expectations for water utility  
8 companies were higher than for the S&P 500 for the most part from May through August  
9 2020, remained very comparable through mid-July 2021, and have mostly remained below  
10 expectations for the market since then through January 2022.

11 The dashed red line and the solid orange line in Chart 9 on page 40 show investors'  
12 stock price volatility expectations for the overall market (S&P 500) increased significantly  
13 as COVID-19 infections spread to the U.S. and continued to grow exponentially around  
14 the world. The dashed red line and solid orange line show volatility expectations over the  
15 next 30 days and 6 months, respectively. In December 31, 2019, investors expected an  
16 annualized change of 13.78% over the next 30 days. In mid-March 2020, investors'  
17 volatility expectations peaked at over 80% (on March 16, 2020, a point not actually shown  
18 on the chart, which has weekly data on Tuesdays). As of January 25, 2022, investors expect  
19 an annualized change of 31.16%. The solid orange line is higher or lower than the dashed

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<sup>42</sup> The implied volatility for individual stocks and small groups of stocks is almost always higher than the overall market because of the effects of diversification, even when the underlying stocks in the smaller portfolio are less risky, as is the case with water utility companies. As a result, Chart 9 on page 40 adjusts the 6-month expected volatility for the RFC Water Proxy Group by the difference with the 6-month expected volatility for the S&P 500 Index on December 31, 2019 to facilitate the comparison throughout the chart.

red line when investors expect volatility over the 6-month time period to be higher or lower than over the next 30 days.



As discussed below, changes in implied volatility do not paint the full cost of equity picture. We must consider implied covariance, or how much investors expect the volatility of returns for water utility companies to correlate with the overall market (e.g., S&P 500 Index).

**Q. HOW IS COVID-19 IMPACTING FINANCIAL MARKETS AND THE COST OF EQUITY FOR WATER UTILITY COMPANIES?**

**A.** The spread of COVID-19 caused a financial crisis. However, financial data indicate that the capital market upheaval it generated was not long-lasting and did not significantly impact the cost of equity for water utility companies. Investors know that water utility companies provide an essential service that will be used and paid for even during a financial crisis.

Although stock and bond prices remain more volatile than before COVID-19, market data show that investors' volatility expectations have declined for both the overall

1 market and water utility companies since the onset of COVID-19 in mid-March 2020.  
2 Investors' volatility expectations are important, but as explained in my CAPM section on  
3 page 60, investors' expectations regarding the co-variance between water utility stocks and  
4 the overall market are more relevant to cost of equity than volatility expectations alone.  
5 Option-implied betas indicate that investors expect water utility stock price movements to  
6 be less correlated with the overall market than before the pandemic. As explained below,  
7 I use stock option data to calculate an "option-implied beta" which is a measurement to  
8 determine what investors' expectations are regarding the covariance between the expected  
9 returns for the RFC Water Proxy Group and for the S&P 500 Index. On December 31,  
10 2019, the average option-implied beta for my RFC Water Proxy Group was 0.84. As of  
11 January 31, 2022, the average option-implied beta of these 7 water utility companies is  
12 0.59. In other words, investors expect water utility stocks to move only 0.59% for every  
13 percent the S&P 500 Index moves. Before the pandemic, investors expected that water  
14 utility stocks would move about 0.84% for every 1.0% move of the S&P 500 Index.  
15 Declining water utility option-implied betas indicate that investors understand that water  
16 utility companies provide an essential service that will be relatively unimpacted by the  
17 overall economy.

1 **V. COST OF EQUITY CALCULATION**

2 **A. Overview**

3 **Q. PLEASE PROVIDE AN OVERVIEW OF YOUR PERSPECTIVE REGARDING**  
4 **HOW CAPITAL MARKETS RELATE TO THE COST OF EQUITY AND THE**  
5 **OVERALL COST OF CAPITAL**

6 **A.** The cost of capital is the return investors require to provide capital to KIU based on current  
7 capital markets. The spread of COVID-19 has made it more challenging to determine the  
8 current cost of capital because it has drastically increased the speed and intensity of capital  
9 market change. To measure the cost of equity accurately during rapid change, it is critical  
10 to use current market data. Because of the current financial crisis, it is particularly  
11 important to consider model results in the context of extreme financial turbulence. To do  
12 this, it is crucial to consider how capital markets and model results have changed over time  
13 as this crisis has evolved since its onset in March 2020.

14 As discussed above, my COE recommendation is my opinion of the return investors  
15 require to provide equity capital to KIU based on current capital markets. My  
16 recommendation is consistent with the following legal standards set by the United States  
17 Supreme Court for a fair rate of return: “[t]he return to the equity owner should be  
18 commensurate with returns on investments in other enterprises having corresponding  
19 risks”<sup>43</sup> and “sufficient to... support its credit and... raise the money necessary for the  
20 proper discharge of its public duties.”<sup>44</sup>

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<sup>43</sup> Federal Power Commission v. Hope Natural Gas Company 320 U.S. 591, 603 (1944).

<sup>44</sup> Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia  
262 U.S. 679, 692-693 (1923).

1           Because the cost of equity is not a published figure like a bond yield, some  
2           interpretation is required to determine the appropriate market price. My cost of equity  
3           recommendation is based on my computation of what the market indicates investors require  
4           (return on investment) to provide capital to companies with comparable risk to KIU.

5           As explained below, I use current market prices (e.g., stocks, bonds, options), which  
6           measure investors' expectations directly, instead of relying solely on historical data and  
7           analyst forecasts as some rate of return witness often do.

8           A COE based on current market prices (market-based) is superior to a COE based  
9           on "expert" forecasts (non-market-based) and historical data (backward looking) for two  
10          reasons:

- 11           1. The COE that KIU has to pay investors is based on capital markets. Interest  
12           rates remain at historical low levels after a persistent downtrend since the  
13           early 1980s. It is possible interest rates will increase, but if the marketplace  
14           expected interest rates to change, then that would already be part of current  
15           prices.
- 16           2. Capital markets are unpredictable. Regarding capital markets'  
17           unpredictability, investment guru Warren Buffet recently gave the  
18           following advice to investors: "[t]hey should not listen to a lot of the  
19           jabbering about what the market is going to do tomorrow, or next week or  
20           next month because nobody knows."<sup>45</sup>

21          Current capital markets are our best source of investors' expectations regarding  
22          future capital markets, and we should use historical data and analyst forecasts cautiously.

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<sup>45</sup> PBS News Hour, June 26, 2017, Part 1 – America should stand for more than just wealth, says Warren Buffett.

1 **Q. HOW DID YOU ARRIVE AT YOUR COE RECOMMENDATION?**

2 **A.** To arrive at my recommendation, I applied the DCF, including a Constant Growth and a  
3 Non-Constant Growth method and a CAPM analysis to a group of similar companies  
4 (“RFC Water Proxy Group”) using data available through January 31, 2022, as discussed  
5 below. In all of my models, I use both historical averages and the most recently available  
6 spot data for the inputs wherever it is possible and applicable.

7 **Q. CONSIDERING THAT STOCK AND OPTION PRICES AND BOND YIELDS**  
8 **CHANGE DAILY, WOULD IT NOT BE BETTER TO USE HISTORICAL**  
9 **AVERAGES EXCLUSIVELY FOR THE INPUTS IN YOUR MODELS?**

10 **A.** Not necessarily. Most people would agree that the use of spot market data, the value of a  
11 particular input on a particular day, can lead to COE results that can vary over short periods  
12 of time. It may therefore be tempting to find a more stable value based on historical  
13 averages that are not overly influenced by short-term fluctuations in capital markets. When  
14 doing a forward-looking analysis, however, it is equally important to look at the most  
15 recent market data as an indication of trends and where a given value is more likely to be  
16 in the future. This is a broad and generally accepted principle, as made clear in the  
17 following example.

18 As a simple example using historical stock prices to make the point clear, if  
19 Company A’s stock price were to go up linearly over the course of one year from \$50 to  
20 \$100, its average stock price over that year would be \$75. If Company B’s stock price  
21 declined linearly from \$100 to \$50 over the same year, it would have the same exact  
22 average stock price of \$75. But most people would agree that predicting both stock prices  
23 at \$75 over the near future would be overly simplistic and leave readily accessible

1 forecasting data unused. Without relying on any additional data, at the very least, it would  
2 stand to reason that in the near future, Company A's stock price is more likely to be  
3 between \$75 and \$100 than Company B's stock price, and that Company B's stock price  
4 is more likely to be between \$50 and \$75 than Company A's stock price. These  
5 observations cannot be made by looking at the yearly averages alone and must take the  
6 most recent data into consideration.

7 The point above does not eliminate concerns regarding the effect of daily  
8 fluctuations in market data, especially during periods of volatility. As a result, it is  
9 important to consider both averages and recent spot values when using market data for  
10 forward-looking analyses. That is precisely my approach when using market data that are  
11 expected to continue to fluctuate, such as stock prices, dividend yields, betas, and market  
12 risk premia.

13 **Q. CAN A DIFFERENCE OF ONE DAY IN THE SELECTION OF SPOT DATA**  
14 **HAVE A SIGNIFICANT POSITIVE OR NEGATIVE EFFECT ON ROE**  
15 **RESULTS? IF SO, HOW DO YOU GO ABOUT CHOOSING WHICH DAY TO**  
16 **USE FOR MARKET-BASED SPOT DATA?**

17 **A.** Daily fluctuations in stock prices, resulting dividend yields, betas, etc., all have an impact  
18 on resulting ROE calculations, especially when using recent spot values for market data.  
19 Such is the nature of market data, which change from day to day. This is rightfully noted  
20 as a potential risk of using spot data, but given the stated benefits of using recent spot data  
21 for forward-looking analyses, there are ways to address such potential pitfalls.

22 For this reason, it is very important to establish consistent methodologies that  
23 eliminate the possibility of personal bias, especially when using spot market data. I

consistently use the last trading day of the last full calendar month before my schedule preparations for all market-based spot data and as the last day for all historical market-data averages.

It is important to keep in mind that even averages fluctuate over time, and all responsible data analysts must find a consistent and reproducible way to “freeze time” to work with such fluctuations while eliminating bias.

It is also important to point out once again that I use recent spot market-data to establish one benchmark for market-based inputs, which are balanced by the use of historical averages, as stated previously.

## **B. Proxy Group Selection**

**Q. PLEASE EXPLAIN HOW YOU SELECTED THE COMPANIES IN YOUR COMPARABLE PROXY GROUP?**

**A.** My comparable proxy group, referred to as the RFC Water Proxy Group, consists of the 7 publicly traded water utility companies covered by Value Line. These companies are:

<b>TABLE 7: RFC WATER PROXY GROUP COMPOSITION</b>		
	<b>Company Name</b>	<b>Ticker</b>
1	AMER.STATESWATER	AWR
2	AMERICANWATER	AWK
3	ESSENTIALUTIL.	WTRG
4	CALIFORNIAWATER	CWT
5	MIDDLESEXWATER	MSEX
6	YORKWATER	YORW
7	SJWGROUP	SJW



**C. Discounted Cash Flow**

**Q. PLEASE SUMMARIZE THE RESULTS OF YOUR DCF MODELS.**

**A.** I used both the constant growth form of the DCF method, which determines growth based on the sustainable retention growth procedure, and a non-constant growth DCF method. My constant growth form DCF analysis indicates a COE range of between 8.15% and 8.27% for the RFC Water Proxy Group.<sup>46</sup> The results of my non-constant growth DCF method indicate a COE of between 5.75% and 5.80% for the RFC Water Proxy Group.<sup>47</sup>

**Q. WHAT IS THE DISCOUNTED CASH FLOW METHOD?**

**A.** The DCF method, is an approach to determining the COE. The method recognizes that investors purchase common stock to receive future cash payments. These payments come from: (a) current and future dividends, and (b) proceeds from selling stock. A rational investor will buy stock to receive dividends and to ultimately sell the stock to another investor at a gain. The price the new owner is willing to pay for stock is related to that buyer's expectation of future flow of dividends and the future expected selling price. The value of the stock is the discounted value of all future dividends until the stock is sold plus the value of proceeds from the sale of the stock.

**Q. HAVE INVESTORS ALWAYS USED THE DCF METHOD?**

**A.** While investors who buy stock have always done so for future cash flow, the DCF approach first appeared in the 1937 Harvard Ph.D. thesis of John Burr Williams titled *The Theory of Investment Value*. Author Peter L. Bernstein once stated that "Williams' model for valuing

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<sup>46</sup> See Exhibit ALR-3, page 1.

<sup>47</sup> See Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3.

1 a security calls for the investor to make a long-run projection of a company's future  
2 dividend payments..."<sup>48</sup> The Williams DCF model separately discounts each and every  
3 future expected cash flow. Dividends and proceeds from the sale of stock are the expected  
4 cash flows. Its accuracy is therefore unaffected by non-constant growth rates. Myron  
5 Gordon and Eli Shapiro, who helped to make this method widely used, referred to  
6 Williams' work in their paper published in 1956 "*Equipment Analysis: The Required Rate*  
7 *of Profit.*"

8 **D. Constant Growth Form of the DCF Model**

9 **Q. YOU STATE YOU USED THE CONSTANT GROWTH FORM OF THE DCF**  
10 **MODEL. WHAT IS THE CONSTANT GROWTH FORM OF THE DCF MODEL?**

11 **A.** The constant growth form of the DCF model is a form of the DCF method that can be used  
12 in determining the COE when investors can reasonably expect that the growth of retained  
13 earnings and dividends will be constant.

14 Retained earnings are funds that a company keeps in its treasury, so that they are  
15 available for future needs, such as operating expenses, capital expenditures, debt payments,  
16 and new investments. These retained earnings show investors whether the company is  
17 growing, which, in turn, is a measure of the future indicator of dividends and the value of  
18 a company's stock.

19 **Q. DESCRIBE HOW THE CONSTANT GROWTH MODEL WORKS.**

20 **A.** The constant growth model is described by this equation  $k = D/P + g$ , where:<sup>49</sup>

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<sup>48</sup> P. BERNSTEIN, *Capital Ideas: The Improbable Origins of Modern Wall Street* (The Free Press, © 1992).

<sup>49</sup> M. GORDON, *Cost of Capital to a Public Utility*, at 32-33 (MSU Public Utility Studies 1974).

1 k= cost of equity (COE);  
 2 D=Dividend; and  
 3 P=Market price of stock at time of the analysis

4 and where:

5 g=the growth rate, where  $g = br + sv$ ;  
 6 b=the earnings retention rate;  
 7 r=return on common equity investment (referred to below as “book equity”);  
 8 v=the fraction of funds raised by the sale of stock that increases the book value of  
 9 the existing shareholders’ common equity; and  
 10 s=the rate of continuous new stock financing

11  
 12 The constant growth model is therefore correctly recognized to be:

13  
 14 
$$k = D/P + (br + sv)$$

15 The COE demanded by investors is the sum of two factors. The first factor is the  
 16 dividend yield. The second factor is growth (dividends and stock price). The logical  
 17 relationship among these factors is as follows: the dividend yield is calculated based on  
 18 current dividend payments while growth indicates what dividends and stock price will be  
 19 in the future.

20 **Q. WHAT OTHER FACTORS IMPACT HOW ONE USES THE CONSTANT**  
 21 **GROWTH FORM OF THE DCF MODEL?**

22 **A.** Sufficient care must be taken to be sure that the growth rate “g” is representative of the  
 23 constant sustainable growth. To obtain an accurate constant growth DCF result, the  
 24 mathematical relationship between earnings, dividends, book value and stock price must  
 25 be respected.

26 The basic difference between the use of an analysts’ earnings per share growth rate  
 27 in the constant growth DCF formula and using the “br” (b (the earnings retention rate) X r  
 28 (rate of return on common equity investment)) approach is that the “br” form, if properly  
 29 applied, eliminates the mathematical error caused by an inconsistency between the

1 expectations for earnings per share growth and dividends per share growth. Because it  
2 eliminates that error, the results of a properly applied “br” approach will be superior to the  
3 answer obtained from other approaches to the constant growth form of the DCF model.  
4 This is not to say that even a properly applied “br” approach will be perfect. The self-  
5 correcting nature of a properly applied “br” to forecasted differences in earnings per share  
6 and dividends per share growth rates help mitigate the resultant error but should not be  
7 viewed as the perfect way to quantify the impact of expected non-constant growth rates.

8 **Q. ARE YOU AWARE OF CLAIMS ALLEGING THAT THE “BR” APPROACH TO**  
9 **THE CONSTANT GROWTH DCF MODEL IS FLAWED BECAUSE IT RELIES**  
10 **ON THE VALUE OF THE FUTURE EXPECTED RETURN ON BOOK EQUITY**  
11 **“R” TO ESTIMATE WHAT THE EARNED RETURN ON EQUITY SHOULD BE?**

12 **A.** Yes. One common criticism is that it is not reasonable for the DCF to indicate a COE  
13 (market return) that is different (lower or higher) than the expected return on book equity  
14 (accounting). There are multiple reasons why this concern is unfounded:

15 1. The constant growth form of the equation using “br” is:

$$k = D/P + (br + sv)$$

17 In this equation, “k” is the variable for the COE, and “r” is the future  
18 expected return on equity. The COE, “k,” is not the same variable as the  
19 future expected earned return on equity, “r.” In fact, there often is a large  
20 difference between the two.

21 2. The correct value to use for “r” is the return on book equity expected by  
22 investors as of the time the stock price and dividend data are used to  
23 quantify the D/P term in the equation. Therefore, even if future events occur

that may change what investors expect for “r,” the computation of the COE “k” remains correct as of the time the computation was made.

3. The ability of a commission’s ROE decision to influence future cash flow expectations is not unique to the retention growth DCF approach. The five-year analysts’ earnings per share growth rate is a computation that is directly influenced by what earnings per share will be in 5 years. Allowed ROEs impact earning – higher allowed returns lead to higher earnings growth because the higher allowed returns the more earnings are available for reinvestment.

**Q. CAN CHANGES IN THE ACTUAL EARNED RETURNS IMPACT GROWTH ABOVE AND BEYOND WHATEVER GROWTH RESULTS FROM EARNINGS RETENTION?**

**A.** Yes, but large short-term changes in earnings per share caused by a perceived change in the future expected earned returns are unsustainable. The new perceived earned return on book equity should be part of the computation, but the one-time growth spurt to get there is no more indicative of the sustainable growth required in the constant growth DCF formula than the temporary negative growth that occurs when a company has a bad year.

**Q. HOW HAVE YOU IMPLEMENTED THE CONSTANT GROWTH FORM OF THE DCF MODEL IN THIS CASE?**

**A.** I have applied the constant growth form of the DCF model by staying true to the mathematically derived “ $k=D/P + (br + sv)$ ” form of the DCF model. I have also taken care to fully allocate all future expected earnings to either future cash flow in the form of dividends (“D”) or to retained earnings (the retention rate, “b”). This extra accuracy is

1 obtained only when the retention rate “b” is derived from the values used for “D” and “r,”  
2 rather than independently.

3 **Q. PLEASE EXPLAIN HOW YOU OBTAINED THE VALUES YOU USED IN THE**  
4 **CONSTANT GROWTH FORM OF THE DCF METHOD.**

5 **A.** The DCF model generally calls for the use of the dividend expected over the next year. A  
6 reasonable way to estimate next year’s dividend rate is to increase the quarterly dividend  
7 rate by half of the current actual quarterly dividend rate. This is a good approximation of  
8 the rate that would be obtained if the full prior year’s dividend were escalated by the entire  
9 growth rate.<sup>50</sup>

10 I obtained the stock price—“P”—used in my DCF analysis from the closing prices  
11 of the stocks on January 31, 2022. I also obtained an average stock price for the 12 months  
12 ending January 31, 2022 by averaging the high and low stock prices for the year.

13 I based the value of the future expected return on equity— “r” —on the average  
14 return on book equity expected by Value Line, adjusted in consideration of recent returns.  
15 I also made a computation that was based on a review of both the earned return on equity  
16 consistent with analysts’ consensus earnings growth rate expectations and on the actual  
17 earned returns on equity. For a stable industry such as utility companies, investors will

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<sup>50</sup> For example, assume a company paid a dividend of \$0.50 in the first quarter a year ago, and has a dividend growth rate of 4 % per year. This dividend growth rate equals  $(1.04)^4 - 1 = 0.00985$  % per quarter. Thus, the dividend is \$0.5049 in the second quarter, \$0.5099 in the third quarter, and \$0.5149 in the fourth quarter. If that 4 % per annum growth continues into the following year, then the dividend would be \$0.5199 in the 1<sup>st</sup> quarter, \$0.5251 in the 2<sup>nd</sup> quarter, \$0.5303 in the 3<sup>rd</sup> quarter, and \$0.5355 in the 4<sup>th</sup> quarter. Thus, the total dividends for the following year equal \$2.111 ( $0.5199 + 0.5251 + 0.5303 + 0.5355$ ). I computed the dividend yield by taking the current quarter (the \$0.5149 in the 4<sup>th</sup> quarter in this example) and multiplying it by 4 to get an annual rate of \$2.06. I then escalated this \$2.06 by half the 4 % growth rate, which means it is increased by 2 %.  $\$2.06 \times 1.02 = \$2.101$ , which is within one cent of the \$2.111 obtained in the example.

1 typically look at actual earned returns on equity as one meaningful input into what can be  
2 expected for future earned returns on book equity. See Exhibit ALR-3, page 1.

3 This return on book equity expectation used in the DCF method to compute growth  
4 must *not* be confused with the COE. Since the stock prices for the comparative companies  
5 are substantially higher than their book value, the return investors expect to receive on their  
6 market price investment is considerably less than the anticipated return on book value. If  
7 the market price is low relative to book value, the COE will be higher than the future  
8 expected return on book equity, and if the market price is high, then the return on book  
9 equity will be less than the COE.

10 In addition to growing through the retention of earnings, utility companies also  
11 grow by selling new common stock. Selling new common stock increases a company's  
12 growth. I quantified this growth caused by the sale of new common stock by multiplying  
13 the amount that the actual market-to-book ratio exceeds 1.0, by the compound annual  
14 growth rate of stock that Value Line forecasts. The results of that computation are shown  
15 on line 4 of Exhibit ALR-3, page 1.

16 Pure financial theory prefers concentrating on the results from the most current  
17 price because investors cannot purchase stock at historical prices. There is a legitimate  
18 concern, however, about the potential distortion of using just a single price. I present DCF  
19 results based on the most recent stock pricing data (January 31, 2022) as well as the average  
20 of the high and low stock price over the past 12 months to obtain a range of reasonable  
21 values. As shown in Exhibit ALR-3, page 1, the DCF result based on the average of the  
22 high and low stock price for the year ending January 31, 2022 is 8.15%. The DCF result  
23 based on the stock price as of January 31, 2022 is 8.27%. Exhibit ALR-3, page 1, shows

1 more of the specifics of how I implemented the constant growth form of the DCF model  
2 for the RFC Water Proxy Group.

3 **Q. PLEASE EXPLAIN HOW YOU DETERMINED WHAT VALUE TO USE FOR**  
4 **“R” WHEN COMPUTING GROWTH IN YOUR CONSTANT GROWTH FORM**  
5 **OF THE DCF MODEL.**

6 **A.** The inputs I considered are shown in Footnote [C] of Exhibit ALR-3, page 1. The value of  
7 “r” that is appropriate to use in the DCF formula is the value anticipated by investors to be  
8 maintained on average in the future. This Exhibit shows that the average future return on  
9 equity forecasted by Value Line for the RFC Water Proxy Group between 2021 and 2024-  
10 26 is 11.14%. The same footnote also shows that the future expected return on equity  
11 derived from the Zacks consensus forecast is 8.79%, and that the actual returns on equity  
12 earned by the RFC Water Proxy Group on average were 9.49% in 2019, 10.39% in 2020,  
13 and 10.57% in 2021. Based on the combination of the forecasted return on equity derived  
14 from the Zacks consensus, the recent historical actual earned returns, and Value Line’s  
15 forecast, I made the DCF growth computation using a 10.80%<sup>51</sup> value of “r”.

16 **Q. WHAT COE IS INDICATED BY THE CONSTANT GROWTH FORM OF THE**  
17 **DCF METHOD THAT YOU RELY ON FOR YOUR RECOMMENDATION?**

18 **A.** The result of my DCF analysis using the Constant Growth form of the DCF indicates a  
19 COE range of between 8.15% and 8.27% for the RFC Water Proxy Group.<sup>52</sup> Since these  
20 DCF findings use analysts’ forecasts to derive sustainable growth (in part) and on analysts’

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<sup>51</sup> I used 10.80% in consideration of historical returns, allowed returns, and Value Line projected returns for the RFC Water Proxy Group.

<sup>52</sup> Exhibit ALR-3, page 1.



forecasts of dividend growth and book value growth in the non-constant form of the DCF method, the results should be considered as conservatively high. This is because, as previously mentioned above, analysts' forecasts of such growth have been notoriously overstated.

My results are not as influenced by overly-optimistic analysts' forecasts as would have been the case had I merely used analysts' five-year earnings growth rate forecasts as a proxy for long-term growth. This is because the DCF methods I use compute sustainable growth rates, rather than growth rates that can exaggerate the growth rate due to assuming that a relatively short-term forecast (5 years) will remain indefinitely.

**E. Non-Constant Growth Form of the DCF Model**

**Q. PLEASE EXPLAIN HOW YOU IMPLEMENTED THE NON-CONSTANT GROWTH FORM OF THE DCF MODEL.**

**A.** The non-constant growth form of the DCF model determines the return on investment expected by investors based on an estimate of each separate annual cash flow the investor expects to receive. For the purpose of this computation, I have incorporated Value Line's detailed annual forecasts to arrive at the specific non-constant growth expectations that an investor who trusts Value Line would expect. This implementation is shown on Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3. In the first stage, cash flow entry is the cash outflow an investor would experience when buying a share of stock at the market price. The subsequent years of cash flow are equal to the dividends per share that Value Line forecasts. For the intermediate years of the forecast period in which Value Line does not provide a specific dividend, the annual dividends were obtained by estimating that dividend

1 growth would persist at a compound annual rate. The cash flow at the end of the forecast  
2 period consists of both the last year's dividend forecast by Value Line, and the proceeds  
3 from the sale of the stock. The stock price used to determine the proceeds from selling the  
4 stock was obtained by estimating that the stock price would grow at the same rate at which  
5 Value Line forecasts book value to grow.

6 **Q. WHY DID YOU USE BOOK VALUE GROWTH TO PROVIDE THE ESTIMATE**  
7 **OF THE FUTURE STOCK PRICE?**

8 **A.** For any given earned return on book equity, earnings are directly proportional to the book  
9 value. Furthermore, book value growth is the net result after the company produces  
10 earnings, pays a dividend and also, perhaps, either sells new common stock at market price  
11 or repurchases its own common stock at market price.

12 Once these cash flows are entered into an Excel spreadsheet, the compound annual  
13 return an investor would achieve as a result of making this investment was obtained by  
14 using the Internal Rate of Return (IRR) function built into the spreadsheet. As shown on  
15 Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3, this multi-stage DCF model produced  
16 an average indicated COE of 5.75% based on the year-end stock price, and 5.80% based  
17 on average prices for the year ending January 31, 2022 for the RFC Water Proxy Group.

18 **Q. YOUR NON-CONSTANT GROWTH DCF MODEL USES ANNUAL EXPECTED**  
19 **CASH FLOWS. SINCE DIVIDENDS ARE PAID QUARTERLY RATHER THAN**  
20 **ANNUALLY, HOW DOES THIS SIMPLIFICATION IMPACT YOUR RESULTS?**

21 **A.** I used the annual model because it is easier to input the data and for observers to visualize  
22 what is happening. By modeling cash flows to be annual rather than when they are actually  
23 expected to occur causes a small overstatement of the COE.

1 **Q. WHY IS IT A SMALL OVERSTATEMENT OF THE COE IF YOU HAVE**  
2 **MODELED DIVIDENDS TO BE RECEIVED SOME MONTHS AFTER**  
3 **INVESTORS ACTUALLY EXPECT TO RECEIVE THEM?**

4 **A.** The process of changing from an annual model to a quarterly model would require two  
5 changes, not just one. A quarterly model would show dividends being paid sooner and  
6 would also show earnings being available sooner. A company that receives its earnings  
7 sooner, rather than at the end of the year, has the opportunity to compound them. Since  
8 revenues, and therefore earnings, are essentially received every day, a company that is  
9 supposed to earn an annual rate of 9.00% on equity would have to earn only 8.62% if the  
10 return were compounded daily.<sup>53</sup> This reduction from 9.00% to 8.62% would then be  
11 partially offset by the impact of the quarterly dividend payment to bring the result of  
12 switching from the simplifying annual model closer to, but still a bit below 9.00%.

13 **Q. BY USING CASH FLOW EXPECTATIONS AS THE VALUATION PARAMETER,**  
14 **DOES THE NON-CONSTANT DCF MODEL STILL RELY ON EARNINGS?**

15 **A.** Yes. It relies on an expectation of future cash flows. Future cash flows come from  
16 dividends during the time the stock is owned and capital gains from the sale of the stock  
17 once it is sold. Since earnings impact both dividends and stock price, the non-constant  
18 DCF model still relies on earnings.

19 Every dollar of earnings is used for the benefit of stockholders, either in the form  
20 of a dividend payment or earnings reinvested for future growth in earnings. Earnings paid  
21 out as a dividend have a different value to investors than earnings retained in the business.  
22 Recognizing this difference and properly considering it in the quantification process is a

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<sup>53</sup>  $(1 + .0862/365)^{365} = 1.09 = 9.00\%$ .

1 major strength of the DCF model and is why the non-constant DCF model as I have set  
2 forth is an improvement over either the price-to-earnings ratio (P/E ratio) or dividend/price  
3 (D/P) methods. Comparing the P/E ratios and the dividend yield (D/P) are helpful as a rule  
4 of thumb, but they must be used with caution because, among other reasons, two companies  
5 with the same dividend yield can have a different COE if they have different retention rates.  
6 A DCF model is more reliable than these rules of thumb because it can account for different  
7 retention rates, among other factors.

8 **Q. WHY IS THERE A DIFFERENCE TO INVESTORS IN THE VALUE OF**  
9 **EARNINGS PAID OUT AS A DIVIDEND COMPARED TO THE VALUE OF**  
10 **EARNINGS RETAINED IN THE BUSINESS?**

11 **A.** The return on earnings retained in the business depends upon the opportunities available to  
12 that company. If a regulated utility reinvests earnings in needed “used and useful” utility  
13 assets, then those reinvested earnings have the potential to earn at whatever return is  
14 consistent with ratemaking procedures allowed and the skill of management in prudently  
15 operating the system.

16 When an investor receives a dividend, he can either reinvest it in the same or  
17 another company or use it for other things, such as paying down debt or paying living  
18 expenses. Although an investor could theoretically use the proceeds from any dividend  
19 payments to simply buy more stock in the same company, when an investor increases her  
20 investment in a company by purchasing more stock, the transaction occurs at market price.  
21 However, when the same investor sees her investment in a company increase because  
22 earnings are retained rather than paid as a dividend, the reinvestment occurs at book value.  
23 Stated within the context of the DCF terminology: earnings retained in the business earn at

1 the future expected return on book equity “r,” and dividends used to purchase new stock  
2 earn at the rate “k.” When the market price exceeds book value (that is, the market-to-  
3 book ratio exceeds 1.0), retained earnings are worth more than earnings paid out as a  
4 dividend because “r” will be higher than “k.” Conversely, when the market price is below  
5 book value, “k” will be higher than “r,” meaning that earnings paid out as a dividend earn  
6 a higher rate than retained earnings.

7 **Q. IF RETAINED EARNINGS WERE MORE VALUABLE WHEN THE MARKET-**  
8 **TO-BOOK RATIO IS ABOVE 1.0, WHY WOULD A COMPANY WITH A**  
9 **MARKET-TO-BOOK RATIO ABOVE 1.0 PAY A DIVIDEND RATHER THAN**  
10 **RETAIN ALL OF THE EARNINGS?**

11 **A.** Retained earnings are more valuable than dividends only if there are sufficient  
12 opportunities to profitably reinvest those earnings. Regulated utility companies are  
13 allowed to earn the cost of capital only on assets that are used and useful in providing utility  
14 service. Investing in assets that are not needed may not produce any return at all. For  
15 unregulated companies, opportunities to reinvest funds are limited by the demands of the  
16 business. For example, how many new computer chips can Intel profitably develop at the  
17 same time?

18 **Q. UNDER THE NON-CONSTANT DCF MODEL, IS IT NECESSARY FOR**  
19 **EARNINGS AND DIVIDENDS TO GROW AT A CONSTANT RATE FOR THE**  
20 **MODEL TO BE ABLE TO ACCURATELY DETERMINE THE COST OF**  
21 **EQUITY?**

22 **A.** No. Because the non-constant form of the DCF model separately discounts each and every  
23 future expected cash flow, it does *not* rely on any assumptions of constant growth. The

dividend yield can be different from period to period, and growth can bounce around in any imaginable pattern without harming the accuracy of the answer obtained from quantifying those expectations. When the non-constant DCF model is correctly used, the answer obtained is as accurate as the estimates of future cash flow.

**Q. WHAT COST OF EQUITY DOES YOUR NON-CONSTANT GROWTH DCF METHOD INDICATE?**

**A.** My non-constant growth DCF method indicates a COE of between 5.75% and 5.80%.<sup>54</sup>

**F. Capital Asset Pricing Model**

**Q. PLEASE DESCRIBE THE CAPM.**

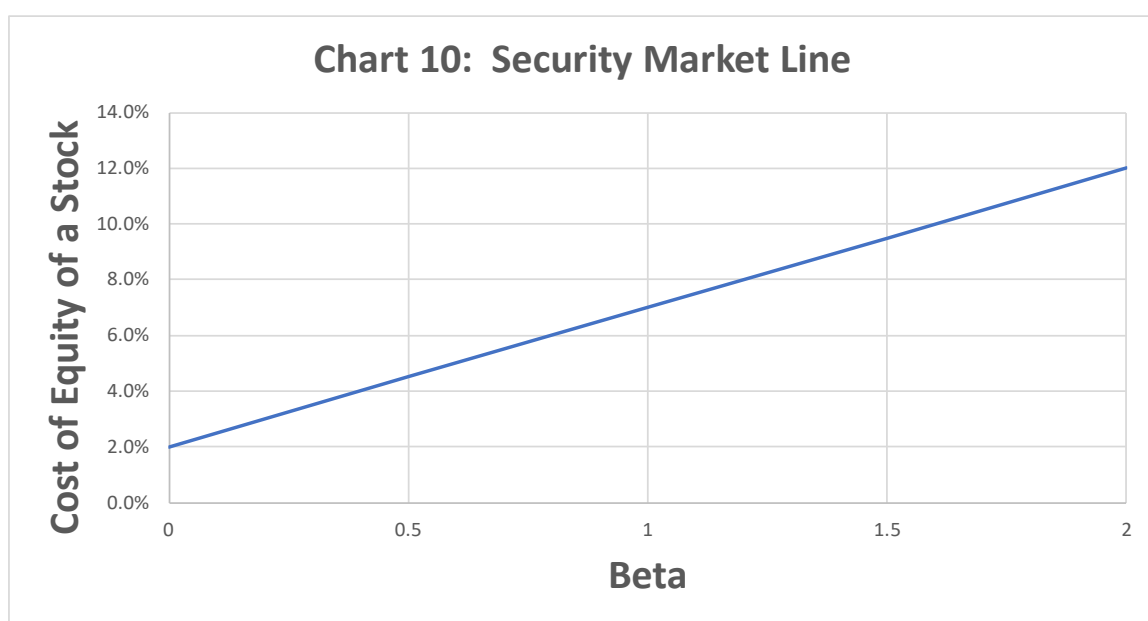
**A.** CAPM stands for “Capital Asset Pricing Model.” The CAPM relates return to risk; specifically, it relates the expected return on an investment in a security to the risk of investing in that security. The riskier the investment, the greater the expected return (i.e., the cost of equity) investors require to make that investment.

Investors in a firm’s equity face two types of risks: (1) firm-specific risk and (2) market risk (financial analysts refer to this market risk as systematic risk). Firm-specific risk refers to risks unique to the firm, such as management performance and losing market share to a new competitor. Investors can reduce firm-specific risk by purchasing stocks as part of a diverse portfolio of companies if they construct the portfolio to cause the firm-specific risk of individual companies to balance out. Market-related risk refers to potential impacts from the overall market, such as a recession or interest rate changes. This risk

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<sup>54</sup> Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3.

cannot be removed by diversification, so the investor must bear it no matter what. Because the investor has no option but to bear market risk, the investor's cost of equity will reflect that risk. The CAPM predicts that for a given equity security, the cost of equity has a positive linear relationship to how sensitive the stock's returns are to movements in the overall market (e.g., S&P 500). A security's market sensitivity is measured by its beta.<sup>55</sup> As shown in Chart 10 below, the higher the beta of a stock, the higher the company's cost of equity—the return required by the investor to invest in the stock.



Here is the standard CAPM formula:

$$K = R_f + \beta_i * (R_m - R_f)$$

Where:

K is the cost of equity;

R<sub>f</sub> is the risk-free interest rate;

R<sub>m</sub> is the expected return on the overall market (e.g., S&P 500);

[R<sub>m</sub> – R<sub>f</sub>] is the premium investors expect to earn above the risk-free rate for investing in the overall market (“equity risk premium” or “market risk premium”); and

<sup>55</sup> The covariation of the return on an individual security with the return on the market portfolio.

1  $\beta$  (Beta) is a measure of non-diversifiable, or systematic, risk.

2 **Q. PLEASE EXPLAIN HOW YOU IMPLEMENTED THE CAPM.**

3 **A.** First, I determined appropriate values or ranges for each of the three model inputs: (a) Risk-  
4 Free Rate, (b) Beta, and (c) Equity Risk Premium. Second, I used the equation above to  
5 calculate the cost of equity implied by the model. Below I will explain how I calculated  
6 the three model inputs and summarize the CAPM cost of equity numbers resulting from  
7 those inputs. Table 8 and Table 9 on page 89 show the results of my CAPM.

### 8 **Risk-Free Rate**

9 **Q. WHAT RISK-FREE RATE DID YOU USE IN YOUR CAPM?**

10 **A.** It is generally preferable to use the market yield on short-term U.S. Treasury yields as the  
11 risk-free rate because these bonds have a beta close to zero. *Principles of Corporate*  
12 *Finance* states “The CAPM... calls for a short-term interest rate.”<sup>56</sup> I chose to use a risk-  
13 free rate based on both long- and short-term Treasury yields, however, because, as  
14 indicated by the steepness of the yield curve,<sup>57</sup> investors with a longer investment horizon  
15 would likely use a higher risk-free rate as an opportunity cost for their investment  
16 decisions. My short-term risk-free rate is based on the yield of 3-month U.S. Treasury  
17 bills and my long-term risk-free rate is based on the yield of 30-year U.S. Treasury bonds.  
18 In line with my Spot and Weighted Average CAPM approaches, I use both spot values as  
19 of January 31, 2022 and weighted averages over the 3 months ending on that date for these  
20 two yields.

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<sup>56</sup> Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 228.

<sup>57</sup> The yield curve on U.S. Treasury bonds relates the yield to its time to maturity. We say the current yield curve is steep because the difference in yield between short-term (near 0%) and long-term (over 1%) bonds is large in percentage terms.



1 As outlined in Exhibit ALR-4, page 2, my spot and weighted average short-term  
2 risk-free rates are 0.22% and 0.13%, respectively. My spot and weighted average long-  
3 term risk-free rates are 2.11% and 1.96%, respectively.

4 U.S. government bonds are reasonable to use as a risk-free rate because they have  
5 a negligible risk of default. The value of short-term U.S. Treasury bills has a relatively  
6 low exposure to swings in the overall market. The value of long-term U.S. Treasury bonds  
7 is relatively more exposed to the market and therefore must be used with caution. I  
8 considered using a risk-free rate based on subtracting the historical spread between long-  
9 term and short-term U.S. Treasury bills from current long-term yields, as recommended by  
10 some financial textbooks.<sup>58</sup> I did not use this method because in the current capital markets,  
11 this method results in an unreasonably low risk-free rate (under 0%).

12 Regarding my weighted average risk-free rates, it is worth noting that any form of  
13 averaging or weighting approach applied to the last 12 months of historical yield data  
14 would not have any significant effect on my CAPM results.

15 **Q. WHAT IS YOUR RESPONSE TO ANALYSTS WHO CLAIM THAT THE CAPM**  
16 **MUST BE IMPLEMENTED WITH A LONG-TERM INTEREST RATE (E.G.,**  
17 **YIELD ON 30-YEAR TREASURY BOND) AS AN ESTIMATE OF THE RISK-**  
18 **FREE RATE COMPONENT OF THE CAPM?**

19 **A.** When looking for a security to calculate an estimate of the risk-free rate, it could be argued  
20 that it is appropriate to find one with a term or maturity that best matches the life of the  
21 asset being financed. In that sense, the 30-year Treasury bond yield can be argued to be

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<sup>58</sup> Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 228.

1 ideal for this specific application. However, it is equally important to find a security that  
2 has a beta coefficient with the overall market as close to zero as possible, because by the  
3 very definition of the risk-free rate in the CAPM model, its movements should have no  
4 correlation to the movements of the market. And this is where the problem with the 30-  
5 year Treasury bond yield arises, as it has an established non-zero beta. The 3-month  
6 Treasury bill yield has a considerably lower beta, and therefore is superior in that respect  
7 to the 30-year Treasury bond yield. Neither one is a perfect fit on both fronts, which is  
8 why I have chosen to consider both as proxies for the risk-free rate to establish a range for  
9 my CAPM results.

10 **Q. HOW DO YOU RESPOND TO ANALYSTS WHO CLAIM THAT THE RISK-**  
11 **FREE RATE SHOULD BE BASED ON INTEREST RATE FORECASTS FROM**  
12 **FIRMS SUCH AS BLUE CHIP FINANCIAL?**

13 **A.** It is important to recognize that current long-term Treasury bond yields represent a direct  
14 observation of investor expectations and there is no need to use “expert” forecasts such as  
15 Blue Chip to determine the appropriate risk-free rate to use in a CAPM analysis or any  
16 other COE calculations.

17 Many economists and forecasters will continue to be quoted in the press  
18 prognosticating on possible developments that are truly unpredictable. The Nobel Laureate  
19 Economist Daniel Kahneman stated the following regarding forecasting:

20 It is wise to take admissions of uncertainty seriously, but declarations of  
21 high confidence mainly tell you that an individual has constructed a  
22 coherent story in his mind, not necessarily that the story is true.<sup>59</sup>

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<sup>59</sup> Daniel Kahneman, *Thinking Fast and Slow* (New York: Farrar, Straus, and Giroux, 2011): 212.

1 As Chart 4 on page 32 shows, Blue Chip Financial forecasted in 2014 that 30-Year  
2 U.S. Treasury bonds would be over 5% by 2021 while in fact they turned out to be under  
3 2%.

4 The time covered in Chart 4 on page 32 was chosen to provide a concrete example.  
5 Blue Chip's interest rate forecasts have been persistently inaccurate. A recent paper  
6 published by the Congressional Budget Office determined Blue Chip consensus forecasts  
7 exhibited "significant positive bias" between 1984 and 2012 and "have become more  
8 biased and less accurate over time."<sup>60</sup>

### 9 Beta

#### 10 **Q. WHAT BETA DID YOU USE IN YOUR CAPM?**

11 **A.** Since the cost of equity should be based on investor expectations, I chose to use two betas.  
12 My "forward beta" is based on forward-looking investor expectations of non-diversifiable  
13 risk. My "hybrid beta" is based on both forward-looking investor expectations and  
14 historical return data.

15 Most published betas are based exclusively on historical return data. For example,  
16 Value Line publishes a 5-year historical beta for each of the companies it covers. However,  
17 it is also possible to calculate betas based on investors' expectations of the probability  
18 distribution of future returns. This probability distribution of future returns expected by  
19 investors can be calculated based on the market prices of stock options.

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<sup>60</sup> *Did Treasury Debt Markets Anticipate the Persistent Decline in Long-Term Interest Rates?*, Congressional Budget Office, Edward N. Gamber, page 2. This paper can be found at: <https://www.cbo.gov/system/files/115th-congress-2017-2018/workingpaper/53153-interestrateswp.pdf>

1 **Q. WHAT IS A STOCK OPTION?**

2 **A.** A stock option is the right to buy or sell a stock at a specific price for a specified amount  
3 of time. A call option is the right to buy a stock at a specified exercise or strike price on  
4 or before a maturity date. A put option is the right to sell a stock at a specified exercise or  
5 strike price on or before a maturity date. For example, a call option to purchase Apple  
6 Computer stock for \$230 on January 17, 2020, allows the owner the option (not the  
7 obligation) to buy Apple stock for \$230 on that date. At the end of July 2019, Apple stock  
8 was trading at about \$215 per share. Why would anyone pay for the right to buy a stock  
9 higher than the current price? Investors who purchased those call options thought there  
10 was a chance Apple stock would be trading higher than \$230 on January 17, 2020, and  
11 those options gave those investors the right to buy Apple stock for \$230 and profit by  
12 selling it at the market price on that date, if it was higher. The price of Apple's stock was  
13 \$317.98 at the close of trading on January 17, 2020. Therefore, the investor who purchased  
14 this call option for \$635 on July 31, 2019, earned a profit of \$8,163<sup>61</sup> at expiry on January  
15 17, 2020. On the other hand, the investor who purchased an Apple put option with the  
16 same expiration date and strike price on July 31, 2019, would have lost the price of the  
17 option (\$2,248) and gained nothing on the expiration date because the right to sell Apple  
18 stock for \$230 when the price is over \$300 is worthless.

19 The market prices of put options and call options provide information regarding the  
20 probability distribution of future stock prices expected by investors. Using established  
21 techniques, I am able to use price data for stock options of my RFC Water Proxy Group  
22 companies and the S&P 500 Index to determine investors' return expectations, including

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<sup>61</sup> \$8,163 profit from exercising call option (\$31,798 from selling at \$317.98 market price - \$23,000 cost to purchase at \$230) - \$635 (\$6.35 X 100) option purchase price. Note: Each call option is the right to purchase 100 shares.

1 the relationship (covariance) between the return expectations for individual RFC Water  
2 Proxy Group companies and those for the overall market (S&P 500). This covariance  
3 between the expected returns for my RFC Water Proxy Group and for the S&P 500  
4 indicates what investors expect betas will be in the future. I refer to betas based on option  
5 price calculations as “option-implied betas.”

6 **Q. PLEASE EXPLAIN HOW YOU CALCULATED THE BETAS USED IN YOUR**  
7 **CAPM.**

8 **A.** Traditionally, the betas used in CAPM calculations are calculated from historical returns.  
9 This approach has strengths and weaknesses. An alternative way to calculate betas is to  
10 incorporate investors’ return expectations by calculating option-implied betas as explained  
11 in the previous paragraph. As discussed below, I have chosen to use both historical and  
12 option-implied betas in my CAPM analysis. I chose to use option-implied betas in my  
13 CAPM analysis because, among other reasons, studies have found that betas calculated  
14 based on investor expectations (option-implied) provide information regarding future  
15 perceived risks and expectations.<sup>62</sup>

16 As shown in Chart 1 on page 19, stock option prices indicate that investors currently  
17 expect lower betas for the RFC Water Proxy Group in the future.

18 Exhibit ALR-4, page 3 contains the last three months of data used in creating Chart  
19 1 on page 19, which is what I use in my CAPM analysis. Specifically, I use the following  
20 two betas in my CAPM analysis:

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<sup>62</sup> Bo-Young Chang & Peter Christoffersen & Kris Jacobs & Gregory Vainberg. (2011) Option-Implied Measures of Equity Risk, *Review of Finance* 16: 385-428.

1. **Hybrid Beta:** 50% Option-Implied Beta (6 months) + 25% Historical Beta (6 months) + 15% Historical Beta (2 years) + 10% Historical Beta (5 years).
2. **Forward Beta:** 100% Option-Implied Beta (6 months).

**Q. PLEASE EXPLAIN HOW YOU CALCULATE HISTORICAL BETAS.**

**A.** I calculate historical betas following the methodology used by Value Line, with some modifications. Specifically, Value Line adheres to the following guidelines:

1. Returns for each security are regressed against returns for the overall market in the following form:

$$\text{Ln}(p^I_t / p^I_{t-1}) = a_I + B_I * \text{Ln}(p^m_t / p^m_{t-1})$$

Where:

- $p^I_t$  is the price of the security I at time t
  - $p^I_{t-1}$  is the price of the security I one week before time t
  - $p^m_t$  and  $p^m_{t-1}$  are the corresponding values of the market index
  - $B_I$  is the regression estimate of Beta for the security against the market index
2. The natural log of the price ratio is used as an approximation of each return and no adjustment is made for dividends paid during the week.
  3. Weekly returns are calculated on one day of the week, with a stated preference for Tuesdays to minimize the effect of holidays as much as possible.

1                   4. Betas calculated using the regression method above are adjusted as per  
2                   Blume (1971)<sup>63</sup> using the following formula:

$$\text{Adjusted } B_I = 0.35 + 0.67 * \text{Calculated } B_I$$

3  
4                   There are four differences between my historical beta calculations and Value Line's  
5                   calculations:

6                   1. The first significant difference is that whereas Value Line uses the New  
7                   York Stock Exchange Composite Index as the market index, I use the S&P  
8                   500 Index.

9                   2. Another important difference is that whereas Value Line calculates weekly  
10                  returns on one day of the week, with a stated preference for Tuesdays, I  
11                  calculate weekly returns on all days of the week.

12                3. Value Line only calculates betas every 3 months in their quarterly company  
13                reports, whereas I use the same consistent methodology to calculate betas  
14                every week during the most recent 3 complete months (November 2021  
15                through January 2022).

16                4. Value Line always uses a 5-year period for the return regression,<sup>64</sup> whereas  
17                I calculate historical betas for periods of 6 months, 2 years, and 5 years, as  
18                shown in Chart 1 on page 19.

19                In the following pages, I explain my rationale for making the four modifications  
20                above to Value Line's beta calculation methodology.

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<sup>63</sup> M. Blume, On the Assessment of Risk, *The Journal of Finance*, Vol. XXVI, March 1971.

<sup>64</sup> They offer betas calculated over different time periods on their website, including 3 years and 10 years.

1 **Q. WHY DO YOU CALCULATE YOUR HISTORICAL BETAS VS. THE S&P 500**  
2 **INDEX INSTEAD OF THE NYSE COMPOSITE INDEX, AS VALUE LINE DOES?**

3 **A.** A critical factor in the calculation of a beta coefficient is the choice of index to represent  
4 the overall market. Using exactly the same beta calculation methodology with a different  
5 market index will result in different values of beta for a given company or portfolio –  
6 sometimes significantly different values (10 basis points or more). It is easy to jump to the  
7 conclusion that this points to a flaw in CAPM theory, as different values of beta would  
8 result in a different implied cost of equity. However, another key component of the CAPM,  
9 the market risk premium, also depends on the choice of market index, which in theory  
10 would have an offsetting effect on the COE calculation. This points to the most important  
11 aspect of selecting a market index for a CAPM analysis, which is to be consistent and use  
12 the same index for the calculation of beta as for the calculation of the market risk premium.  
13 This is a fundamental concept of the CAPM and using betas based on one index with a  
14 market risk premium based on a different index yields invalid results.

15 As stated above, Value Line calculates its published betas based on the NYSE  
16 Composite Index. Most methodologies used to calculate the market risk premium,  
17 including those I rely on, are based on the S&P 500 Index, so using them in the CAPM  
18 together with Value Line betas exactly as published would yield invalid results.

19 For this reason, I calculate my historical betas versus the S&P 500 Index, making  
20 my CAPM approach entirely consistent. This is in contrast to the approach used by  
21 numerous rate of return witnesses who use betas based on a different index (NYSC) than  
22 their equity risk premium component (S&P 500), rendering their CAPM results



1 inconsistent and unreliable. Any use of Value Line Betas together with an equity risk  
2 premium based on the S&P 500 Index falls under this unreliable category.

3 As an aside related to my option-implied betas, using the S&P 500 Index  
4 consistently throughout my CAPM has the added benefit that this index has a much larger  
5 number of options traded, which makes the calculation of option-implied betas more  
6 reliable.

7 **Q. WHY DO YOU CALCULATE YOUR HISTORICAL BETAS USING WEEKLY**  
8 **RETURNS ON EVERY DAY OF THE WEEK AS OPPOSED TO USING ONLY**  
9 **ONE DAY OF THE WEEK, AS VALUE LINE DOES?**

10 **A.** Using one day of the week to calculate weekly returns for use in the regression analysis  
11 used to calculate historical betas has the unintended effect of generating different values of  
12 betas depending on the day of the week that is used. To clarify, if one were to use Value  
13 Line's precise methodology for calculating a 5-year historical beta for a given company  
14 using weekly returns calculated on Tuesdays, the resulting beta value would be different  
15 than the resulting value if one were to use the same exact methodology, but using weekly  
16 returns calculated on Wednesdays, or any other day of the week. Even though 5-year  
17 historical betas should in theory be quite stable and should not change very much from one  
18 day to the next, calculating returns on only one day of the week results in differences that  
19 can be significant and make no sense conceptually.

20 I only became aware of this side-effect recently, but it is easy to understand why it  
21 happens. Even though there is some correlation due to some overlap, the set of weekly  
22 returns calculated on Mondays is a completely different set of numbers than the set of  
23 weekly returns calculated on Tuesdays. As a result, there are five 5-year betas that can

1 result from Value Line's methodology, and even though the Monday beta for a given  
2 company will change slowly from week to week, the change between the Monday beta and  
3 the Tuesday beta, calculated just one trading day apart, can be quite significant.

4 Since I became aware of this undesirable effect, I began calculating my historical  
5 betas based on an all-encompassing set of weekly returns calculated on every trading day  
6 in the beta calculation period. This methodology has the effect of averaging out the five  
7 possible betas that could result from using only one day of the week for the return  
8 calculations,<sup>65</sup> as Value Line does. In this way, a 5-year beta calculated on any two  
9 consecutive trading days would only change minimally, as it should.

10 Using a daily calculation of weekly returns could be criticized for the resulting  
11 overlap in a weekly return from Monday to Monday with that from Tuesday to Tuesday.  
12 However, given that the overlap is consistent and equal for the net effect of every trading  
13 day, no trading day is given undue weight in the regression. Even though the effect of each  
14 trading day appears 5 times in the weekly return data, there are also 5 times the total number  
15 of weekly returns in the overall set used in the regression, so any individual trading day  
16 has the same relative weight than in Value Line's methodology. The fact that the resulting  
17 beta value of this aggregate approach turns out to be a sort of average of the five possible  
18 values that would result from Value Line's methodology on different days of the week is  
19 the final confirmation that this is the superior approach for calculating a historical beta  
20 based on weekly returns.

21 Using a daily calculation of weekly returns has the added marginal benefit of  
22 providing more data pairs to be used in historical beta calculations for shorter periods, such

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<sup>65</sup> The resulting beta is not a direct arithmetic or geometric average of the other five betas, but rather a regression based on the union of all five possible sets of weekly returns.

as for 6-month historical betas, where instead of 25 return pairs, the regression is performed on 117 return pairs.

**Q. ARE THERE ADDITIONAL BENEFITS TO DOING YOUR OWN HISTORICAL BETA CALCULATIONS?**

**A.** Doing my own historical beta calculations using Value Line's established methodology allows me to see how beta values change from week to week and to use the most up-to-date beta calculations instead of relying on stale beta values that can be more than 3 months old.

**Q. WHY DO YOU USE PERIODS OF 6 MONTHS, 2 YEARS, AND 5 YEARS FOR YOUR HISTORICAL BETA CALCULATIONS, AS OPPOSED TO RELYING EXCLUSIVELY ON THE 5-YEAR PERIOD USED BY VALUE LINE?**

**A.** Using shorter periods for the return regression analysis portion of the historical beta calculation allows me to see if the correlation between the returns of each of the companies in my RFC Water Proxy Group and those of the S&P 500 Index has changed in the last 2 years or 6 months. Using a 5-year period exclusively tends to make recent changes in the correlation more difficult to identify because of the weight of 5 years of data.

**Q. WOULD YOU AGREE THAT CHANGES IN MARKET DYNAMICS WILL HAVE A LARGER EFFECT ON 6-MONTH HISTORICAL BETAS THAN THEY WILL ON 2-YEAR OR 5-YEAR HISTORICAL BETAS?**

**A.** Yes. As with other historical metrics based on a given time period, say, average stock prices, the longer the time horizon under consideration, the more data points are considered, and the smaller the effect of any one given change in the data set.

1 **Q. IS THIS LARGER EFFECT ON 6-MONTH HISTORICAL BETAS FROM**  
2 **CHANGES IN MARKET DYNAMICS A GOOD OR A BAD THING?**

3 **A.** The answer depends on what the beta will be used for. I would argue that in any attempt  
4 to forecast the beta coefficient of a company for any forward-looking analysis such as the  
5 cost of capital calculations in this proceeding, more recent historical data should be given  
6 more relevance than data from 5 or 10 years ago. The weight of 10 years of data makes a  
7 beta coefficient react extremely slowly to market developments. Even pronounced  
8 permanent market changes can take more than 6 months to have a detectable effect on a  
9 10-year beta.

10 As with using spot values and averages of historical market data, I believe the right  
11 answer is not to use *either* 6-month historical betas or historical betas with longer horizons,  
12 but to consider *both*. For this reason, I have created my hybrid betas, which take into  
13 consideration 6-month, 2-year, and 5-year historical betas along with forward-looking,  
14 option-implied betas.

15 **Q. DO YOU THINK IT IS A GOOD IDEA TO RELY ON 6-MONTH HISTORICAL**  
16 **BETAS DESPITE MARKET DEVELOPMENTS IN THE PAST YEAR THAT**  
17 **SOME WOULD CALL “MARKET DISLOCATIONS?”**

18 **A.** Financial markets are constantly in flux due to the influence of countless factors. What  
19 some people may refer to as “market dislocations,” though arguably more significant, I  
20 would say are just some of the numerous factors that are constantly affecting markets. To  
21 attempt to separate any one specific factor from “real” underlying market dynamics would  
22 be an exercise in futility.

1 Furthermore, it is very difficult if not impossible for anyone to predict how long  
2 any one influencing factor will be present or how long its effects will be felt by financial  
3 markets. When interest rates came down to historical lows in 2008, many analysts referred  
4 to it as an aberration that would be short-lived. Twelve years later, rates have not only  
5 remained low, but have come down even further due to yet another unexpected event.  
6 COVID-19 affected markets tumultuously, and though the initial wall of the tsunami has  
7 passed, no one can say for sure if its direct fallout and the effects of its reverberations or a  
8 resurgence will continue to affect financial markets for months or years to come.

9 So, in response, yes, I think it is a good idea to use 6-month historical betas to  
10 measure recent and current market dynamics regardless of recent developments. I use them  
11 as part of my hybrid betas in conjunction with longer-term historical betas and forward-  
12 looking, option-implied betas to achieve the most reasonable result.

13 Speaking specifically about the most significant initial impact caused of the onset  
14 of the COVID-19 pandemic in March 2020, it should be pointed out that 6-month betas  
15 calculated in the past 3 months no longer cover that period of time.

16 **Q. GIVEN THE SHORTER PERIOD COVERED BY 6-MONTH HISTORICAL**  
17 **BETAS, CAN THEY STILL BE CONSIDERED STATISTICALLY**  
18 **SIGNIFICANT? HOW MANY DATA POINT PAIRS ARE USED IN THE**  
19 **CALCULATION OF YOUR 6-MONTH HISTORICAL BETA COEFFICIENTS?**

20 **A.** A 6-month historical beta based on weekly returns calculated weekly is calculated using  
21 26 closing price points for a company and for its corresponding market index, in this case  
22 the S&P 500 Index. This translates into 25 pairs of return data that are then used in the

1 regression analysis. This is most certainly enough data to achieve statistical significance  
2 as addressed further below.

3 Furthermore, as stated above, the recent improvement in my calculation of  
4 historical betas of using weekly returns on every day of the week as opposed to using only  
5 one day of the week, as Value Line does, has the added benefit of providing significantly  
6 more data pairs to be used in the regression analysis used to calculate beta. For 6-month  
7 historical betas, instead of relying on 25 return pairs, the regression is performed on 117  
8 return pairs.

9 **Q. HOW MANY DATA POINT PAIRS ARE NECESSARY TO ESTABLISH A**  
10 **STATISTICALLY SIGNIFICANT CORRELATION BETWEEN TWO**  
11 **VARIABLES IN A REGRESSION ANALYSIS, SUCH AS THE ONE USED TO**  
12 **ESTABLISH BETA COEFFICIENTS?**

13 **A.** Establishing a minimum number is somewhat subjective, though various authorities on  
14 statistics argue the number is between 3 and 8 data pairs. While one can broadly correctly  
15 generalize that the more data point pairs one uses, the more certain one can be about the  
16 significance of the results of any correlation analysis, this is very different from stating that  
17 one cannot achieve statistical significance with a relatively low number of data pairs. In  
18 fact, it is important to realize that one can achieve statistical significance with less than 10  
19 data pairs, and that even hundreds of data pairs do not guarantee statistical significance.  
20 For precisely this reason, statisticians have developed a tool that helps determine statistical  
21 significance based on the number of data pairs in a regression analysis.

A “table of critical values” of Pearson’s correlation, which can be readily found online<sup>66</sup> or in most statistics books, tells a statistician that for 25 data point pairs (implying  $N-2=23$  “degrees of freedom”), a correlation, or beta, coefficient of 0.505 or higher will occur *by chance* with a probability of only 0.01.<sup>67</sup> As explained in more detail in the text regarding how to use the table of critical values,<sup>68</sup> any beta coefficient above this level, and certainly above the 0.730 3-month average for the recent 6-month betas for my RFC Water Proxy Group, by definition are considered statistically significant. The threshold for statistical significance for 117 data point pairs (implying 115 “degrees of freedom”), is so low that it is not even included in the table of critical values. The maximum “degrees of freedom” listed is 100, with an already very low threshold of 0.254.

**Q. PLEASE EXPLAIN HOW YOU CALCULATED OPTION-IMPLIED BETAS.**

**A.** Calculating option-implied betas of a company requires (1) obtaining stock option data for that company and a market index, (2) filtering the stock option data, (3) calculating the option-implied volatility for the company and for the index, (4) calculating the option-implied skewness for the company and for the index, and (5) calculating option-implied betas for the company based on implied volatility and skewness for the company and for the index. There are various ways one could choose to perform the steps above, but I chose to filter stock option data and calculate option-implied volatility<sup>69</sup> and skewness<sup>70</sup> following exactly the same methodology used by the Chicago Board of Options Exchange

<sup>66</sup> E.g., [https://researchbasics.education.uconn.edu/r\\_critical\\_value\\_table/#](https://researchbasics.education.uconn.edu/r_critical_value_table/#)

<sup>67</sup> In fact, many researchers use a more lenient “alpha level” of 0.05 for determinations of statistical significance.

<sup>68</sup> [https://researchbasics.education.uconn.edu/statistical\\_significance/](https://researchbasics.education.uconn.edu/statistical_significance/)

<sup>69</sup> CBOE Volatility Index White Paper, 2018. Please note that the cover page says, “proprietary information.”

However, this document has been in the public domain for over 3 years.

<sup>70</sup> The CBOE SKEW Index, 2010. Please note that the cover page says, “proprietary information.” However, this document has been in the public domain for over 3 years.

1 (CBOE) in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index,  
2 respectively.

3 I start my process with publicly available trading information for all the options for  
4 a given security (company or index) for a complete trading day. I then filter the option  
5 data as described by the CBOE using the following guidelines:

- 6 1. Use the mid-quote or mark (average of bid and ask) as the option price.
- 7 2. Use only out-of-the-money call and put options.
  - 8 • Determine the “moneyness” threshold where absolute difference
  - 9 between call and put prices is smallest (using CBOE “Forward Index
  - 10 Price” formula).
  - 11 • Include “at-the-money” call and put options and use average of call
  - 12 and put prices as price for “blended” option.
- 13 3. Exclude all zero bids.
- 14 4. Exclude remaining (more out-of-the-money) options when two sequential
- 15 zero bids are found.

16 I then apply the series of formulas clearly described in both of the CBOE’s white  
17 papers to the remaining options to calculate Option-Implied Volatility and Option-Implied  
18 Skewness. In the words of the CBOE, each of its two indices is “an amalgam of the  
19 information reflected in the prices of all of the selected options.” To be clear, Implied  
20 Volatility is not exactly the same as the VIX Index, and Implied Skewness is not exactly  
21 the same as the SKEW Index, but both indices are directly based on their corresponding  
22 statistical value.



Option-Implied Volatility reflects investors' expectations regarding future stock price movements. Option-Implied Skewness reflects investors' expectations regarding how implied volatility changes for strike prices that are closer and further to the current value of the underlying stock price.

The CBOE calculates Times to Expiration by the minute—as do I. The Time to Expiration of traded options cannot be changed and varies from day to day. For the sake of consistency, the CBOE calculates the VIX and SKEW indices on a “30-day” basis by interpolating for two sets of options with Times to Expiration closest to the 30-day mark. I prefer to focus on as long of a time horizon as possible for forecasting purposes. Option Times to Expiration vary significantly for various stocks but can relatively consistently be found to go out to 6 months (180 days) for utility companies. Therefore, for the sake of consistency, I have chosen to interpolate to calculate 6-month volatility and skewness where possible. Occasionally, Times to Expiration for a given stock do not go out to 180 days. If the greatest Time to Expiration available is 171 days (95%) or greater, I use the volatility and skewness for that group of options as a proxy for the 180-day volatility and skewness, respectively.

Finally, once I have calculated the option-implied volatility and skewness for each company and index using the methodology described above, I calculate option-implied betas using the following formula developed by Christoffersen, Chang, Jacobs and Vainberg (2011):<sup>71</sup>

$$\beta_i = \left( \frac{SKEW_i}{SKEW_m} \right)^{1/3} \left( \frac{VAR_i}{VAR_m} \right)^{1/2}$$

<sup>71</sup> Bo-Young Chang & Peter Christoffersen & Kris Jacobs & Gregory Vainberg. (2011) Option-Implied Measures of Equity Risk, *Review of Finance* 16: 385-428.

Where:

$\beta_i$ : option – implied beta of security (e.g. stock, fund);  
 $SKEW_i$ : skewness of security;  
 $SKEW_m$ : skewness of overall market (S&P 500);  
 $VAR_i$ : variance of company;  
 $VAR_m$ : variance of overall market (S&P 500).

**Q. YOU CALCULATE YOUR OPTION-IMPLIED BETAS BASED ON A 6-MONTH HORIZON. WOULD IT NOT BE BETTER TO USE A LONGER FORECASTING HORIZON?**

**A.** The methodology I use to calculate my option-implied betas “allows for the computation of a complete term structure of beta for each company so long as the options data are available,”<sup>72</sup> so there is nothing inherent in the methodology that limits it to a certain time horizon.

For many applications, including cost of capital, one could argue that the longer the time horizon for the option-implied betas, the better. However, the limitation on the forecasting horizon is always set by the longest expiration period of the options currently traded in the market. Some companies trade options with expiration periods up to 2 or 3 years into the future. As evidenced by the exhaustive option data in my working papers, the maximum expiration period for the options of the companies in my RFC Water Proxy Group is approximately 8 months.<sup>73</sup> New options are issued roughly every 3 months for all of these companies, so the maximum expiration period on any given trading day is somewhere between 5 and 8 months. For consistency across companies in my proxy group and across dates within the 3-month period on which my analysis is focused (November

<sup>72</sup> Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 24.

<sup>73</sup> In November 2021, options for American Water Works stock with an expiration period of roughly 13 months were introduced into the market.

1        2021 through January 2022), I chose to use 6 months for the time horizon of my option-  
2        implied betas. If the maximum expiration period for the options of a given company on a  
3        given day is less than 6 months, I use the maximum expiration period as an approximation  
4        for the target 6-month horizon.

5                Simply because some may argue that it may be preferable to use longer time  
6        horizons in place of or in addition to a 6-month horizon, it does not mean that a 6-month  
7        option-implied beta is of no relevance or cannot be used. That would be tantamount to  
8        saying you cannot use a 1-year Value Line Earnings Per Share estimate, or that the  
9        minimum relevant forecast is 2 or 3 years. In fact, for purposes of option-implied betas, it  
10       would be difficult to say if a time horizon of 1 year, for instance, is necessarily always  
11       better than a time horizon of 6 months. An option-implied forward-looking beta, even with  
12       a time horizon of less than 6 months, is still a useful tool in interpreting the current  
13       expectations of investors at any given time.

14               A final strong argument in support of using 6-month option-implied betas in a cost  
15       of capital calculation looking years into the future is that, as expanded upon on page 83,  
16       the authors of the paper on which I based my option-implied betas concluded that their  
17       predictive powers are not limited to 6 months into the future. In fact, they conclude that 6-  
18       month option-implied betas have stronger predictive power than 6-month, 1-year, or 5-year  
19       historical betas when attempting to forecast betas 1 or 2 years into the future.

1 **Q. WHY DIDN'T YOU USE LONG-TERM EQUITY ANTICIPATION SECURITIES,**  
2 **WHICH ARE OPTIONS CONTRACTS WITH AN EXPIRATION DATE OF**  
3 **TYPICALLY MORE THAN 1 YEAR?**

4 **A.** It is not possible to use Long-Term Equity Anticipation Securities (LEAPS) to calculate  
5 option-implied betas for all utility companies because these contracts are not traded for  
6 many of them. As stated above, the maximum expiration period for the options of the 7  
7 companies in my RFC Water Proxy Group is approximately 8 months, and so for  
8 consistency across companies and dates, I chose to use 6 months for the time horizon of  
9 my option-implied betas. As explained above, option-implied betas calculated from  
10 options contracts with expiration periods less than 1 year, in my case 6 months, are still a  
11 useful tool in interpreting investors' current expectations and are superior to the historical  
12 betas. As a further note, I use LEAPS in my CAPM when the data is available. The risk  
13 premium portion of my CAPM is based on options contracts with expiration periods  
14 exceeding 1 year, and as far out as 36 months.

15 **Q. HOW DID YOU DECIDE ON THE RELATIVE WEIGHTS YOU ALLOCATE TO**  
16 **EACH COMPONENT OF YOUR HYBRID BETAS? IS THERE ANY ACADEMIC**  
17 **SUPPORT FOR YOUR APPROACH?**

18 **A.** I am not aware of any academic study specifically focused on the optimal relative weight  
19 of historical betas to predict future betas. However, the authors of the paper I relied upon  
20 for guidance on the calculation of my option-implied betas did attempt to quantify the  
21 predictive power of 6-month option-implied ("forward-looking") betas as well as that of 6-  
22 month ("180-day"), 1-year, and 5-year historical betas by back-testing historical  
23 predictions with actual *ex post* results, or "realized" betas, for the 30 companies in the Dow

1 Jones Index. In addition to using each of the betas above independently, they also  
2 measured the predictive power of a “mixed” beta consisting of a simple average of the six-  
3 month option-implied beta and the 6-month historical beta.

4 Their conclusions for predicting 6-month future betas are as follows:

5 The forward-looking beta outperforms the other methods ten times, and the  
6 same is true for the 180-day historical beta. The mixed beta is the best  
7 performer in seven cases, and the 1-year historical beta in three cases. The  
8 5-year historical beta is always outperformed by at least one other method,  
9 and it often ranks last. The 180-day historical beta clearly dominates the  
10 two other historical methods.<sup>74</sup>

11 Their conclusions for predicting 1-year and 2-year future betas are as follows:

12 Somewhat unexpectedly, the performance of the forward-looking beta  
13 compared to that of the 180-day historical beta is much better [for the one-  
14 year prediction] than [for the six-month prediction], and this conclusion  
15 carries over to [the two-year prediction]. The mixed beta also perform [sic]  
16 well. It is perhaps not surprising that the performance of the 180-day  
17 historical beta [for the one- and two-year predictions] is poorer than [for the  
18 six-month prediction], because the horizons used in the construction of  
19 realized betas are no longer equal to 180 days. What is harder to explain is  
20 why the correlation between realized beta and forward-looking beta is in  
21 many cases higher [for the one- and two-year predictions] than [for the six-  
22 month prediction]. Finally, it is also interesting that the 1-year and 5-year  
23 historical betas do not perform well [for the one-and two-year predictions].  
24 In summary, [for the one-year prediction] either the forward-looking beta  
25 or the mixed beta is the best performer in nineteen out of thirty cases. [For  
26 the two-year prediction], this the case twenty-two times out of thirty.<sup>75</sup>

27 Their conclusions strongly support the use of 6-month historical betas, 6-month  
28 option-implied betas, and/or an average of the two as predictors of future betas 6 months,  
29 1 year, or 2 years into the future. They also seem to indicate that historical betas lose  
30 predictive power the longer the period that is used.

<sup>74</sup> Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 16.

<sup>75</sup> Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 17.

I decided on the composition of my hybrid betas primarily based on the conclusions of the authors above. A mixed or hybrid beta made up of 50% historical betas and 50% forward-looking option-implied betas seemed to be the best way to go. Though the predictive power of longer-term historical betas seems to be quite reduced, it is not zero, so in an effort to preserve the effect of longer-term market trends in my hybrid betas, I chose to further subdivide the historical component into 50% (25% of the hybrid) for the stronger predicting 6-month historical betas, 30% (15% of the hybrid) for the 2-year historical betas, and 20% (10% of the hybrid) for the 5-year historical betas.

**Market Risk Premium**

**Q. PLEASE EXPLAIN HOW YOU CALCULATED THE EQUITY RISK PREMIUM USED IN YOUR CAPM.**

**A.** Traditionally, the risk premium used in CAPM calculations is derived from historical returns and/or equity analyst projections. The former approach is historically accurate but does not take into account investors' expectations for future market risks and returns. The latter approach is based on analyst projections, which are not market-based and do not reflect current investor expectations. A superior market-based way to calculate the equity risk premium is to use option-implied return expectations, which is the approach I have used.

My equity risk premium is the expected return on the S&P 500 minus the risk-free rate. I calculate an expected return on the S&P 500 by using stock options traded on this index. To begin with, I use exactly the same methodology used by the Chicago Board of Options Exchange to filter stock option data and calculate option-implied volatility and

1 skewness,<sup>76</sup> as described in detail in the Beta section on page 77. The volatility and  
2 skewness calculated in this way describe a probability function representing the possible  
3 trajectories for the S&P 500 implied by the options market. The resulting skewed  
4 probability function can be closely approximated by a log-normal function using  
5 established statistical formulas, which then make it straightforward to calculate the  
6 expected growth for the S&P 500 for any given cumulative probability. A cumulative  
7 probability of 50% represents the median of the probability distribution, or the option-  
8 implied market consensus, which is how I arrive at my calculation of expected market  
9 growth.

10 Once the option-implied growth rate of the S&P 500 has been estimated as  
11 described above, I add the dividend yield and subtract the risk-free rate to arrive at the  
12 market risk premium, as laid out in Exhibit ALR-4, page 4 and Exhibit ALR-4, page 6. In  
13 line with my Spot and Weighted Average CAPM approaches, I use both spot values as of  
14 January 31, 2022 and weighted averages over the 3 months ending on that date for option-  
15 implied growth, dividend yields, and short- and long-term risk-free rates in these  
16 calculations to arrive at a total of 4 estimated values for the market risk premium. The  
17 market risk premium I use in my Weighted Average CAPM analysis with short- and long-  
18 term risk-free rates is 10.03% and 8.20%, respectively. The market risk premium I use in  
19 my Spot CAPM analysis with short- and long-term risk-free rates is 10.51% and 8.62%,  
20 respectively.

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<sup>76</sup> As used in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index, respectively.

1 **Q. DID YOU TAKE INTO CONSIDERATION THE DIFFERENCE IN**  
2 **VOLATILITIES ACROSS EXPIRATION PERIODS IN THE OPTIONS TRADED**  
3 **ON THE S&P 500?**

4 **A.** Yes. The volatility implied by the options market changes over time as investors'  
5 perception of risk changes. For example, during a crisis, implied volatility generally  
6 increases as investors expect that stock market prices have a greater chance of large swings  
7 compared to times when there is no crisis. As discussed earlier, investors also often have  
8 different volatility expectations over different time periods. For example, on any given  
9 day, investors might expect volatility to be relatively high over the next 30 days and to  
10 decrease over the next year or longer. The same holds true for skewness, even though it is  
11 less intuitive to understand changes in skewness than in volatility. Because of these  
12 changes across option expiration periods, I take a weighted average of the entire term  
13 structure of the option-implied volatility and skewness, which for the S&P 500 typically  
14 goes out to 24 to 36 months, interpolating where necessary, and giving the most weight to  
15 the option expiration period of 12 months.

16 **Q. WHICH CUMULATIVE PROBABILITY DID YOU USE TO ESTIMATE THE**  
17 **OPTION-IMPLIED GROWTH OF THE S&P 500 IN THE CALCULATION OF**  
18 **YOUR MARKET RISK PREMIUM AND WHY?**

19 **A.** I used a cumulative probability of 50.0% in the calculation of my option-implied growth  
20 for the S&P 500, which results in a value of 9.44% as of January 31, 2022 and a value of  
21 8.86% for the weighted average of the 3 months ending on that date. As stated above, a  
22 cumulative probability of 50% represents the median of the probability distribution, or in  
23 this case the option-implied market consensus, which is why I have chosen to use this level.



1           As a matter of fact, using the same probability distribution derived from the options  
2           market described above, one can also calculate the cumulative probability implied by a  
3           given cost of capital. For instance, using the same risk-free rates and betas in my CAPM  
4           analysis, KIU's requested ROE of 11.24% implies an average market risk premium of  
5           15.0%, an average overall market return of 16.0%, average growth for the S&P 500 of  
6           14.8%, and a cumulative probability of 64.5%. In other words, to achieve the required  
7           market growth of 14.8%, reality would have to exceed 64.5% of the scenarios investors  
8           currently see as plausible for the market in aggregate, considerably more than the median  
9           market consensus at 50%. To put this into perspective, it is important to note that values  
10          on the tails of the probability function get increasingly separated, requiring an ever-  
11          increasing growth rate for every additional percentage in the cumulative probability, and  
12          making it impossible to ever arrive at 100%.

13           Using exactly the same methodology, my 7.47% recommended ROE for KIU  
14          implies an average market risk premium of 9.4%, an average overall market return of  
15          10.5%, average growth for the S&P 500 of 9.2%, and a cumulative probability of 50.8%.

16   **Q.    ARE THE CUMULATIVE PROBABILITIES YOU REFER TO IN THIS CASE**  
17   **DIRECTLY COMPARABLE TO THE CUMULATIVE PROBABILITIES YOU**  
18   **HAVE USED OR REFERRED TO IN PRIOR TESTIMONIES YOU HAVE FILED?**

19   **A.**   In late 2020, after significant efforts related to the complexities in processing extremely  
20          large volumes of option data, I was finally able to use option-implied volatility and option-  
21          implied skewness to come up with a log-normal function that approximates the probability  
22          distribution of the possible trajectories for the S&P 500 implied by the options market as  
23          of any given day, as explained above. All of the testimonies I have filed since then, starting

1 in 2021, have used this complete and superior approach along with a cumulative probability  
2 of 50%, representing the median of the probability distribution, or the option-implied  
3 market consensus, to estimate expected market growth. Any references to cumulative  
4 probability in these testimonies are directly comparable.

5 Prior to incorporating skewness into the approximation, I used a normal function to  
6 estimate the same probability distribution referred to above. Using a normal distribution  
7 as an approximation is a simplification used commonly in economics, including in the  
8 Black-Scholes formula for a single option. However, unlike a skewed log-normal function,  
9 a normal function has the same median and mean, meaning that when applied in this case,  
10 the option-implied market consensus of this simplified approximation implies market  
11 growth of 0%. As a result, before using log-normal functions, I had to resort to finding an  
12 adequate level of cumulative probability above 50% to estimate market growth, which is  
13 admittedly somewhat subjective. To be conservative, I often used a cumulative probability  
14 of 68.3%, which is the probability found within one standard deviation of the mean of a  
15 normal distribution, which I understood would lead to a conservatively high estimate for  
16 market growth. It is important to point out that the cumulative probabilities of the  
17 simplified normal function approximation I used in cases before 2021 cannot be directly  
18 compared to the cumulative probabilities of the superior log-normal function  
19 approximation, which takes skewness into account. The considerably improved  
20 approximation based on a log-normal function eliminates all subjectivity in arriving at the  
21 implied market consensus and allows a much better measure of implied cumulative  
22 probabilities of deviations from that market consensus.

## CAPM Results

**Q. PLEASE SUMMARIZE THE RESULTS OF YOUR CAPM.**

**A.** Table 8 and Table 9 below show the results of my Weighted Average CAPM and Spot CAPM Analyses, respectively.

### Weighted Average CAPM

<b>TABLE 8: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY WEIGHTED - All Inputs Weighted From November 2021 to January 2022</b>				
	<u>3-Month Treasury Bill</u>		<u>30-Year Treasury Bond</u>	
	Hybrid Beta	Forward Beta	Hybrid Beta	Forward Beta
Risk-Free Rate	0.13%	0.13%	1.96%	1.96%
Beta	0.74	0.71	0.74	0.71
Risk Premium	10.03%	10.03%	8.20%	8.20%
CAPM	7.55%	7.29%	8.02%	7.81%

Source: Exhibit ALR-4, page 1

### Spot CAPM

<b>TABLE 9: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY (SPOT) SPOT - All Inputs Based on Last Available Data as of January 31, 2022</b>				
	<u>3-Month Treasury Bill</u>		<u>30-Year Treasury Bond</u>	
	Hybrid Beta	Forward Beta	Hybrid Beta	Forward Beta
Risk-Free Rate	0.22%	0.22%	2.11%	2.11%
Beta	0.69	0.59	0.69	0.59
Risk Premium	10.51%	10.51%	8.62%	8.62%
CAPM	7.47%	6.39%	8.05%	7.17%

Source: Exhibit ALR-4, page 5

**VI. CONCLUSION**

**Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS IN THIS CASE.**

**A.** Based on the evidence presented in my testimony, I conclude that the cost of equity allowed for the Company should be between 6.78% and 8.16% (recommended at the midpoint of 7.47%). Based on my recommended common equity ratio of 49.86%, that results in an overall cost of capital of between 5.08% and 5.77% (recommended at 5.42%).

My recommendations satisfy the requirements of *Hope* and *Bluefield* that regulated utility companies should have the opportunity to earn a return commensurate with returns on investments in other enterprises having corresponding risks. My recommendations are consistent with legal standards set by the United States Supreme Court and market data and will allow KIU to raise capital on reasonable terms while fulfilling its obligation to provide safe and reliable service.

**Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

**A.** Yes.